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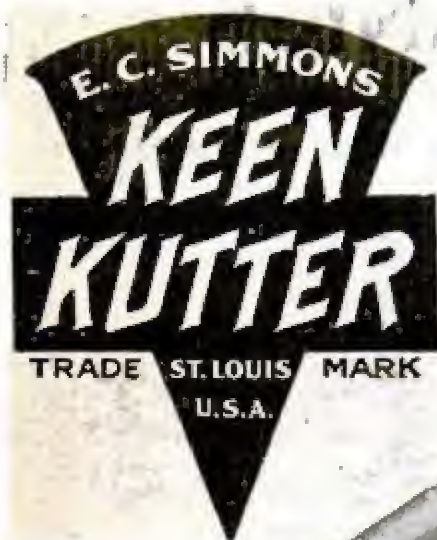
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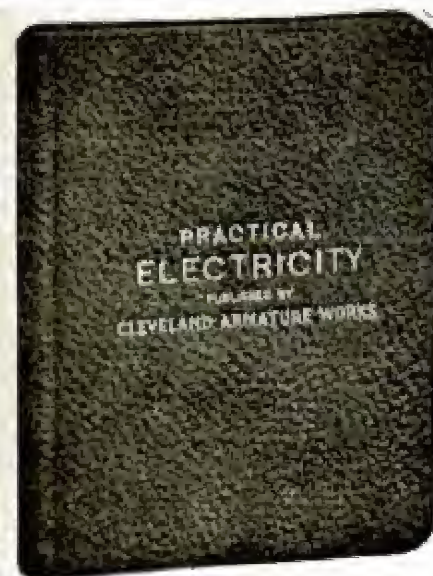
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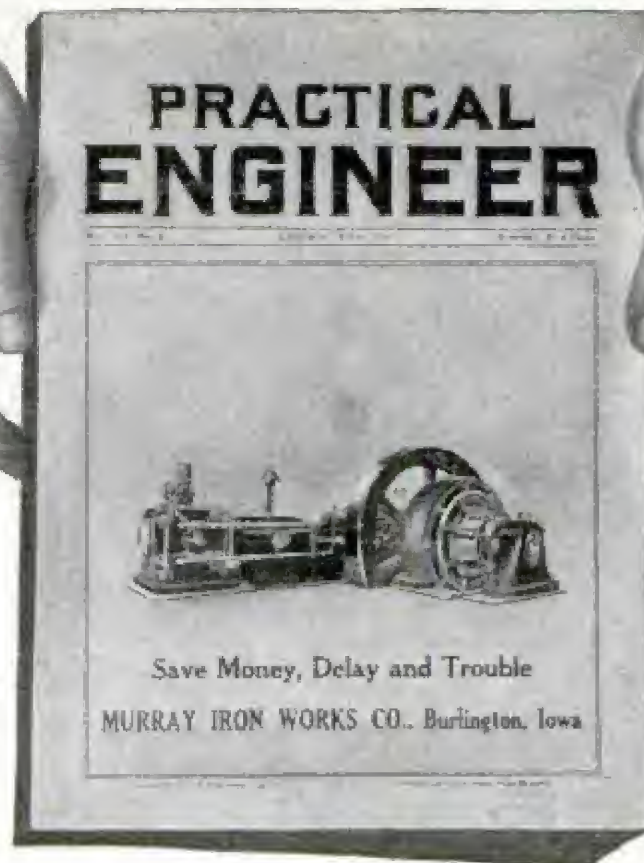
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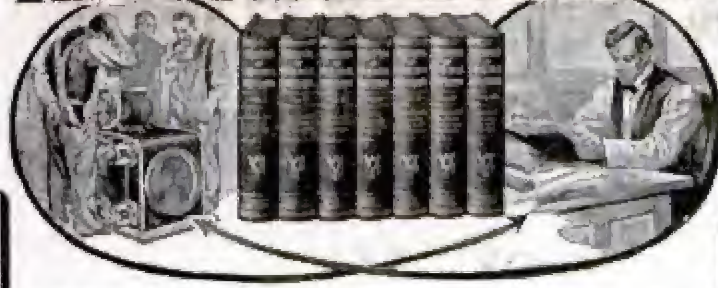
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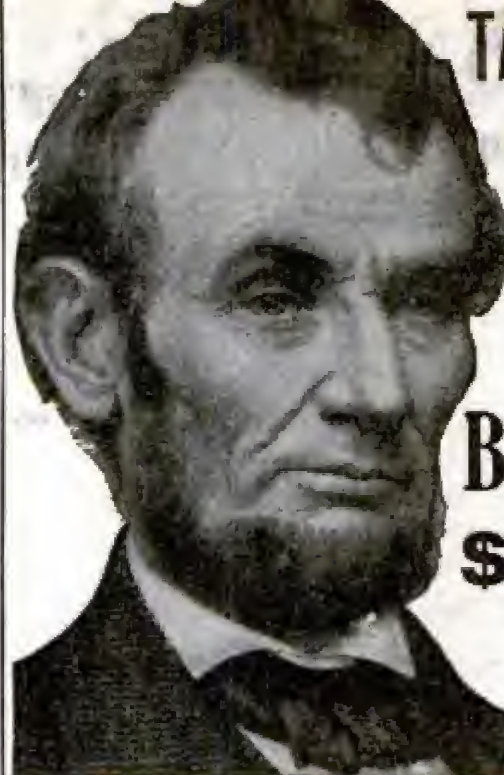
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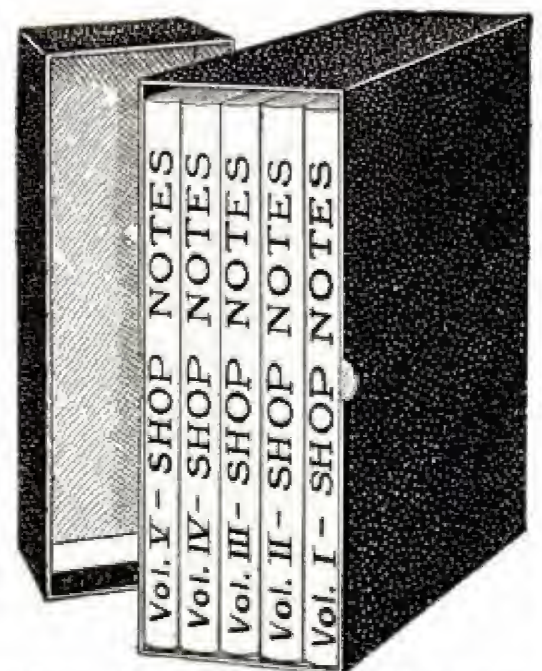
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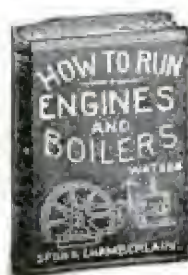
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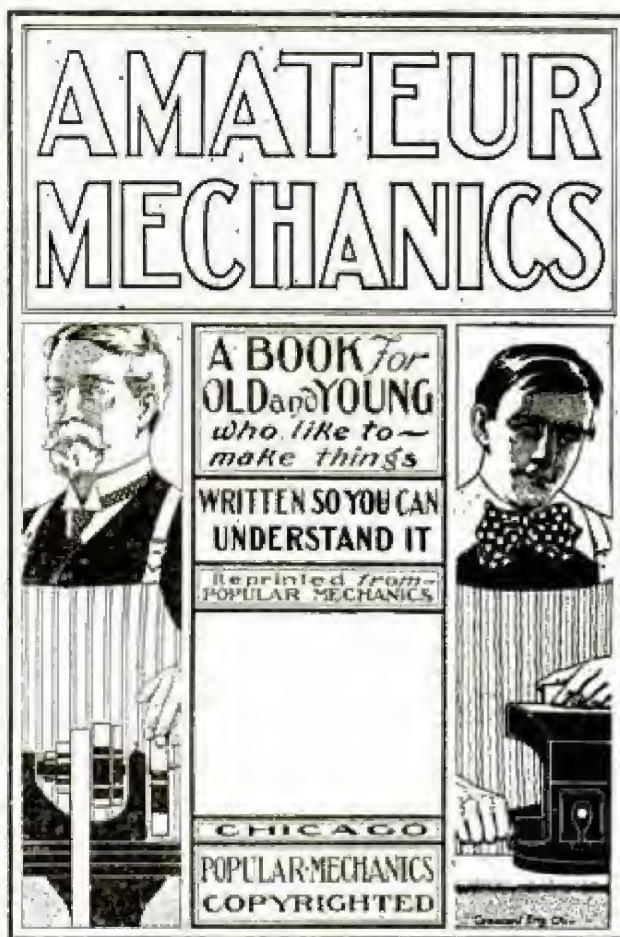
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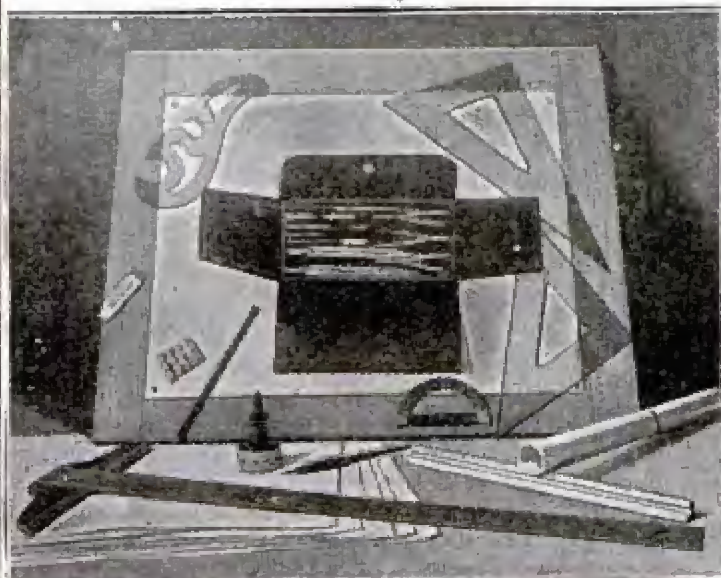
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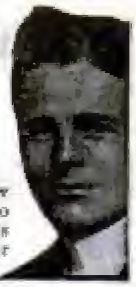
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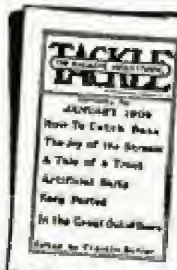
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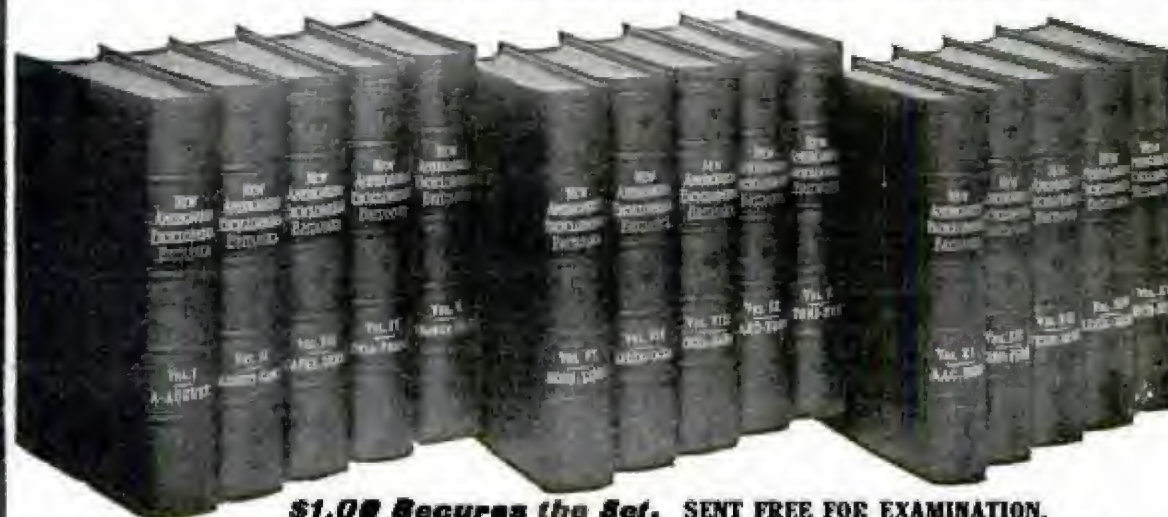
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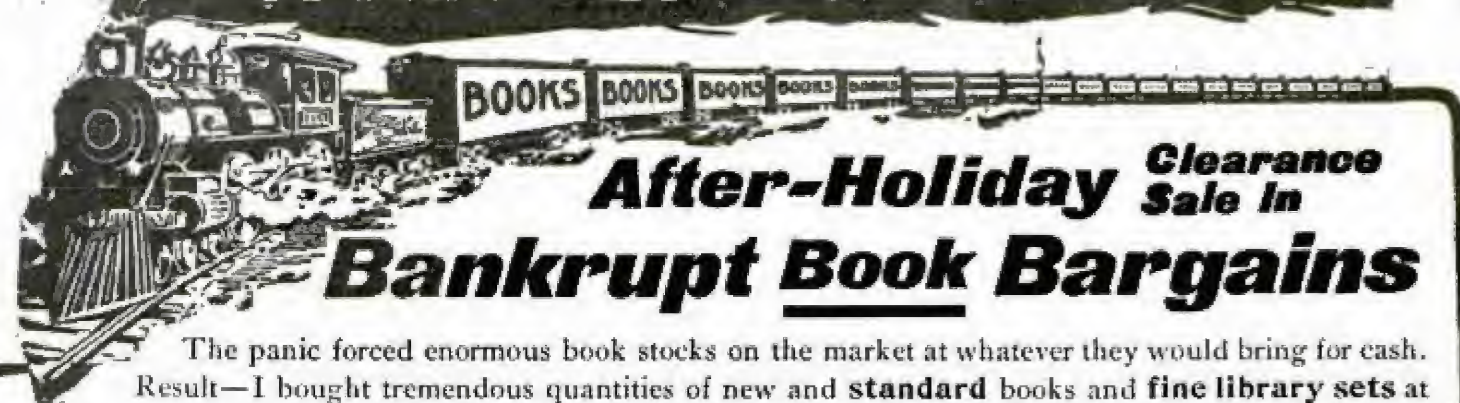
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HOSE BRACKET for garage use. A time saver and a splendid money maker for Agents. Liberal proposition to capable men. Takes the place of rubber hose for washing. Foreman Patent Swinging Hose Bracket Co., 317 So. 12th St., Omaha, Neb.

BUY DIRECT from the manufacturer. High grade gas lamps, \$12.90 and \$14.25 pair. Generators, \$4.90. Wind Shields, \$24.25. Separable Spark Plugs, \$1.50, postpaid. We Repair Automobile Lamps. Cummings-Barry Mfg. Co., 733 Woodward, Detroit, Mich.

1 MEZGER Automatic Wind Shield, complete, \$25. 2 2 cyl. Auto Dash Colls, \$8 each. 25 Soot Proof Plugs, 50c each. 20 Spittire Plugs, 50c each. Rubber covered French Secondary Cable, 7½c per foot; primary, 3c per foot. All goods new and in A1 condition. P. W. Kromer, Room 4, Ansonia Bldg., Buffalo, N. Y.

MOTORCYCLES—BICYCLES

"CONSTRUCTION, MANAGEMENT and Care of Motorcycles." Full of suggestions and useful advice for every Motorcycle Rider, Beginner or Prospective Buyer. Sent prepaid for 25c stamps. Keller & Risque, St. Paul, Minn.

FOR SALE—Two 1908 Indian Motorcycles, 2½ and 3½ h. p., nearly new. Renner Repair Co., New Midway, Md.

M. M. MOTORCYCLES for 1908 offer more profit to the dealer, more real value to the rider than all others combined. Secure territory now. Am. Motor Co., 740 Centre St., Brockton, Mass.

GOOD Indian Motorcycle, 2½ h. p., \$40. Roy C. Evens, Cloverdale, Ind.

WANTED—Heavy motorcycle frame at a bargain. Lock Box 24, Cambridge, Md.

FOR SALE—1906 Indian Motorcycle, new clincher tires, in perfect running order; \$105 takes it. H. L. Frizzell, Route 9, Westminster, Md.

READING STANDARD, 3½ H. P., like new, cost \$225. Sell for \$135. W. H. Johnston, 639 Liberty St., Pittsburg, Pa.

BICYCLE Tires. Something new. Non-skid Cushion Tread, Puncture Proof, Self Healing. Write for low price. Brosius & Brosius, Fort Wayne, Ind.

2½ H. P. HOLLEY MOTORCYCLE, grip control, 2-in. tires, good running order; \$47 if sold immediately. W. J. Wilson, Box 388, Benson, Neb.

FOR SALE—1907 Yale Motorcycle, good running order, \$75. Arthur Knowlton, Wenham, Mass.

FOR SALE—Rambler Bicycle Tandem, in good condition, \$15. For further particulars address Hazen, 121 Crucible St., Pittsburg, Pa.

3 H. P. Curtiss 1908 Motorcycle, \$130. 5 H. P. Curtiss 1905, \$70. Edison Moving Picture Machine, less arc and lens, \$9; another with 1,200 ft. film, gas and electric combined, A. No. 1 condition, \$85. 2 only, No. 2 Remington Typewriters, just overhauled, \$10.75 each. 42 doz. Spectacle Frames, 70c doz. Lense, 2 optical instr. and repairs, \$27. 44 cal. Marlin Rifle, \$7. Patterns and detailed tracings for 7 H. P. stat. gas engine, \$75, new, and cost \$400. Selling out. Send for list. R. O. Rubel, Jr., 1535 Hepburn Ave., Louisville, Ky.

AERONAUTICS

A MODEL AIRSHIP that flies with its own power. No experimenter can afford to be without one. With sufficient power to test your model in actual flight will show more plainly the utility of your idea than a mile of figures. Sent on receipt of \$1. No stamps. P. Ganz, Box 654, Des Moines, Iowa.

OWN A MINIATURE Aeroplane involving principles of Wright machine. Flies 12,000 feet high. 50c, prepaid. Aerial Sales Co., Dept. 2, Lewiston, Maine.

IF YOU ARE INTERESTED in Aeronautics send dime for list of papers describing and illustrating aerial machines of all kinds. Aerial Sales Co., Dept. 12, Lewiston, Maine.

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THE THEORETICAL AND PRACTICAL Boiler Maker, 310 pages, 65 illustrations. By Samuel Nichols. Price, \$2.50. Special Offer, \$1.50, postpaid. Circular free. Address, J. S. Ogilvie Publishing Company, 577 Rose St., New York.

BOOK BARGAINS. Engineering, Mechanical, History, Fiction, Architecture, Carpentry and Building. American School. 10 vols., \$12. Cyclopaedia of Engineering. Cree Pub. Co. 7 vols., \$8. Applied Electricity. American School. 5 vols., \$8. Practical Electricity, Nat. Inst. 4 vols., \$5. Engineering Library. American School. 5 vols., \$8. Cyclopaedia of Carpentry and Building. Cree Pub. Co. 9 vols., \$10. Cyclopaedia of Drawing. American School. 2 vols., \$5. Modern Shop Practice. American School. 4 vols., \$6. French Revolution, by Carlyle, \$1. Lytton's Works, \$1. Dumas' Works, \$1. Dickens' Works, \$1. Books good as new; slightly handled, yet perfect; the bindings are good, stout and sound. Angle, the Book Broker, 361 East 54th St., Chicago.

AUTOMOBILE AND AIRSHIP men should read my subscription and premium offer in display pages. Perlin M. Read.

IF IT'S PRINTED—MacDonald can supply it—Dramatic and Foreign publications of every description—Plays—readings and recitation books—Dramatic Journals supplied by mail. "Catalogue P. M. sent free." Chas. MacDonald, 53 Washington St., Chicago, Ill.

"OUR LITTLE BOOKS for Ladies," postpaid in plain cover, for 25c. (Tell what you want to know.) O. K. Pub. Co., Clerk 190, Decatur, Ill.

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ONE DOZEN PHOTO POST CARDS made from any photograph for 50 cents. Your photograph returned with order, postpaid. All work guaranteed. Enough said. Give us a trial. Photo Card Co., 395 W. 17th St., Chicago, Ill.

10 GOLD EMBOSSED Easter Post Cards, 10 Cents. We want every reader of Popular Mechanics to favor us with one order and be convinced at our low prices and high quality post cards. Great Eastern Photo Studio, 275 12th St., Brooklyn, N. Y.

POST CARDS, twelve for ten cents, assorted, or one cent each. F. J. Mapes, 306½ Clinton St., Brooklyn, N. Y.

FREE—45 Post Cards with 6 mos. subs., 25c, or 20 for 3 mos. at 10c. Collectors' Largest, Oldest 100 page monthly Coins, Post Cards, Stamps, Curios, Relics, Old Books, Mineralogy. Phil West Collectors' World, Superior, Neb.

20 POST CARDS, regular 2 for 5c kind, beautifully colored, all different. Our bargain package, postpaid, for 25c. Jones Supply Co., P2018 East Cumberland, Phila., Pa.

DAYDARK / SERS make from \$5 to \$10 a day. Postal Card Photos taken and finished on the spot anywhere in less than five minutes with this machine without previous experience in photography. Send us a photograph and 50 cents and we will send by return mail one dozen postal cards from your original photograph to show the quality of work that can be done with this machine, or 100 postal cards by mail, \$2. Agents wanted everywhere. Willyerd & Co., Agents for Daydark Photo Post Card Machines, 1805 Gravois Ave., St. Louis, Mo.

DOZEN GENUINE Hand Colored Japanese Post Cards, 50c, postpaid. Ewing's, Decatur, Ill.

EASTER POST CARDS at wholesale. The quality and beauty are beyond description. 250 designs, 75c per 100, prepaid, 10 samples, 10c. Send for our Bulletin. Wm. Jepson Co., Reading, Pa.

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BEAUTIFUL EASTER Post Cards. 20 floral and gold embossed "Greetings," 25c; 85, \$1. Write at once. You'll want more. New England Post Card Co., Dept. 136, Springfield, Mass.

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EDUCATIONAL AND INSTRUCTION

STUDY ELECTRICITY AT HOME—A complete electrical course at home, containing 30-page detail book, 220-page text-book, 200 experiments and over 100 pieces of apparatus. Price, complete, only \$5.60. Catalogue "PS" explains this and other remarkable offers. Thomas M. St. John, 848 Ninth Ave., New York.

CIVIL SERVICE EMPLOYEES are paid well for easy work; examinations of all kinds soon; expert advice, sample questions and Booklet 29 describing positions and telling easiest and quickest way to secure them, free. Write now. Washington Civil Service School, Washington, D. C.

\$200 to \$600 MONTHLY easily made fitting eyeglasses. Short, easy mail course. Diploma. Special reduced tuition fee. Big demand for opticians. Best and easiest money-making business. Quick sales. Tremendous profits. We assist you to start. Write today for free "Booklet 4." Tells how. National Optical College, St. Louis, Mo.

NAUTICAL SCHOOL—Lake and Ocean Navigation, Marine Engineering. Make a specialty of preparing young men for original or raise in papers. Special yachting course. Chicago Nautical School, W. J. Wilson (late lieutenant U. S. Navy), principal, Masonic Temple, Chicago. Send for circular.

A PAYING PROFESSION, acquired at home in spare time. Certain in results. Based on unerring Natural Laws. Gives Health without drugs. Differs from all other methods of healing. National School of Chiropractic, Dept. N. 618 W. Congress St., Chicago, Ill.

ACTING, ELOCUTION, ORATORY—We teach this fascinating and profitable art by mail and prepare you for the stage or speaker's platform. Booklet on dramatic art free. Chicago School of Elocution, 202 Grand Opera House Bldg., Chicago, Ill.

THERE IS a big demand for stenographers. Learn at home, during spare time. Complete course, \$2. R. Newman, 234 W. 120th St., N. Y.

INSTRUCTION in everything concerning pianos and automatic players. Dollar per lesson. Saunders Bros., 1021 Park Rd., Washington, D. C.

TRICKS AND DIVERSIONS with Cards. Book of complete instructions in all kinds of card tricks and deceptions, 25c, postpaid. Ewing's, Decatur, Ill.

TRADE SCHOOLS

AUTOMOBILE SCHOOL—Learn the automobile business, repairing and driving, in which you can earn good wages and have healthful and pleasant work. We give a thorough and practical course in road work and repairing. For full particulars address Academy of Automobile Engineering, 1420 Michigan Ave., Dept. "A," Chicago, Ill.

WANTED—1,000 CHAUFFEURS and Repair Men. Our demand for automobile engineers exceeds the supply; calls for men of intelligence and mechanical bent, commanding \$100 to \$150 monthly, upon graduation. Resident courses, \$15 to \$50. Home correspondence courses completed by practical road and shop work at any of our branches or affiliated schools, highly successful. Look This Up. Auto Schools of America, 742 7th Ave, New York City, or 1642 Michigan Ave., Chicago.

YOUNG MEN AND WOMEN. Garver School of Telegraphy and Railroad, Ashland, O. Teaches in 4 to 6 months. Secures positions. 8 to 9 hour work. Erie Ry. furnishes dispatcher's wire for students. Special Mail Course taught. Endorsed by railroad and telegraph companies. Actual main line practice furnished. Send ten names of young men and receive a Stylus pen.

BUSINESS OPPORTUNITIES

AGENTS—\$300 every month selling our wonderful 7-piece Kitchen Set. Send for sworn statement of \$12 daily profit. Outfit free. Thomas Mfg. Co., 305 Home Bldg., Dayton, Ohio.

DON'T SLAVE FOR OTHERS. Reap the benefits for yourself. Fortunes made operating automatic penny weighing machines. Our scale speaks your weight. Write for Talking Scale circular. The United Vending Machine Co., 629 Caxton Bldg., Cleveland, O.

MY NEW STORE necessity is better than a telephone. Sells better than cash registers or scales ever sold. Sells for \$50 to \$1,000. Your ability alone limits your possibilities. Salesmen, Territory Managers and Local Agents wanted. Ref. First National Bank, Chicago, M. L. Pittner, 183-189 Lake St., Chicago.

START MAIL-ORDER BUSINESS—Sell goods by mail; cash orders, big profits, conducted by anyone, anywhere; we supply everything. Our plan positively successful; satisfaction guaranteed. Write for free booklet and sample catalogue. Central Supply Co., Kansas City, Mo.

AGENTS make \$103.50 per month selling wonderful self-sharpening scissors and cutlery. V. C. Glebner sold 22 pairs in 3 hours, made \$13; you can do it. We show how. Free outfit. Thomas Mfg. Co., 49 Home Bldg., Dayton, Ohio.

I MADE \$50,000 in five years in the mail order business; began with \$5. Anyone can do the work at home in spare time. Send for my free booklet. Tells how to get started. Heacock, Box 803, Lockport, N. Y.

CHAMPION VENDING MACHINES. Used on over 200 railroads. Operate in spare time. An investment of \$150 starts you in a lucrative business which you absolutely control. Send for particulars. Boston Coin Mchs. Co., Boston, Mass.

A MANUFACTURING CHEMIST will sell the Formula and Process for one of the best articles produced in the past twenty years. It is the newest thing on the market and can be sold perpetually in every home, hotel, laundry or institution every week in the year. Do you see its possibilities? Amount of capital required is small compared with the scope of this business, which will net from 400% to 900% clear profit. Business is clean, light, unlimited and permanent and will be a solid investment. Send 10c for the article and full particulars. Don McCloskey, Box 306, Scranton, Pa.

"THOUGHT" TAKES VARNISH OFF, Brings Money in. Acts almost instantaneously on paint, varnish, shellac, enamel, etc., whether on wood, iron or glass. A gallon cleans 50 sq. ft., and costs you \$3, prepaid, but you can make it yourself for 50c with materials easily obtained anywhere. We send guaranteed working formula for \$1 and send the dollar back if it does not more than please you. Write quick; there's money in this for manufacturers and individuals. Stamps acceptable. P. H. Starr & Co., Toledo, O.

YOUR OPPORTUNITY—We offer one hundred thousand shares of stock—company owns three properties—gold and copper. Gold property equipped with ten stamp mill. Copper property just opening high-grade ore. Ten thousand dollars makes both producers. No transportation difficulties. Officers above reproach. Price, fifty dollars per thousand shares, ten monthly payments or \$45 cash with order. Prospectus furnished. Good representatives wanted. Pacific Consolidated Mines Co., Hinckley Block, Seattle, Wash.

7. MONEY MAKING FORMULAS, \$1; worth \$25, or money back. Box 333, Waterford, N. Y.

EMPLOYMENT PERMANENT, good wages, to a good all around man who will invest \$5,000 or more in a successful and well established Garment Hanger factory. Has been paying a big dividend and with recent inventions will make the business more profitable. A. K. Bowman Mfg. Co., Greensburg, Pa.

\$ MONEY \$ MAKING \$ SECRETS \$. If you want to start a business of your own and make money send 4 cents at once for a Valuable Collection of over Two Hundred Ways to Get the Dollars. B. C. Frankson Co., Baltimore, Md.

LEARN CHAIR CANING, "Octagonal Type." Pleasant, clean, profitable employment. Large demand for this kind of work in every locality. 2c stamp brings particulars. H. B. Strong Instruction Bureau, Dept. 2, Homer, Mich.

WE WANT one good man who can raise from \$1,000 to \$50,000 for operating our cigar-vending machines; patents just issued; something new; handle your own money. Write for particulars. Pope Automatic Merchandising Company, Corn Exchange Bank Building, Chicago.

WE START YOU in a permanent business with us and furnish everything. Full course of instruction free. We are manufacturers and have a new plan in the mail order line. Large profits. Small capital. You pay us in three months and make big profit. References given. Sworn statements. Pease Mfg. Co., 1009 Pease Bldg., Buffalo, N. Y.

\$3,000 TO \$10,000 YEARLY easily made in real estate business. No capital required. We teach the business by mail, appoint you special representative, assist you to success. Valuable book free. The Cross Co., 2434 Reaper Block, Chicago. See our other advertisements in this magazine.

BEFORE YOU START in the Mail Order Business or pay any one money for information, drop us a card; we will send you free of charge two books on the Mail Order Business. Murphy Mfg. Co., South Norwalk, Conn.

"DOLLARS & SENSE" FREE! Col. Hunter's great book free with Advertisers' Magazine one year at 50 cents. Indispensable to business men who advertise. Best "Ad School" in existence. Three months' trial subscription, 10 cents. Advertisers' Magazine, 747 Commerce Bldg., Kansas City, Mo.

PATENTS properly and promptly procured. No patent, no pay. Pay fee on allowance. Highest references. Advice and book free. Ohed Billman, Pat. Atty., Cleveland, Ohio.

BIG MONEY. Start a dyeing, cleaning and pressing establishment; unlimited field, enormous profits, no capital needed. We teach you the secrets by mail. Particulars free. Ben-Vonde Co., Dept. C, Staunton, Va.

MAKE MONEY—Little capital needed. My mail order scheme yours for 25c (silver preferred). \$3 plenty to start. Selling no junk. Perry, 1876 Colman Rd., Cleveland, Ohio.

NOW IS THE TIME to start a business of your own; the new book will open up your latent powers in finance. Sent to any address on receipt of \$1. Particulars free. Address P. W. Ostwald, Box 116, Bayfield, Colo.

START in Hosiery business. Large profits made, easy sales from samples. No capital or experience required. Whole or part time. Goods replaced free when hole appears. Exclusive territory. Triplewear Mills, Franklin and Girard, Philadelphia.

WE OFFER for 60 days any part of 5,000 shares in circuit of moving picture houses, paying 5% monthly, at \$1, same as I paid for it. Twenty houses will pay 250% annually. Am not a stock broker. References: any Seattle business man; Dunn or Bradstreet. Send remittance to E. Earle Littlefield, Seattle, Wash.

SOME YOUNG MAN who has \$300 and would like to engage in light manufacturing of an article needed in every household, can learn of a good chance. Address Herbert B. Wilcox, Keene, N. H.

AGENTS WANTED

AGENTS—Portraits, 35 cents; frames, 15 cents; sheet pictures, 1 cent; stereoscopes, 25 cents; views, 1 cent. 30 days' credit. Samples and catalog free. Consolidated Portrait Co., 172 W. Adams St., Chicago.

WANTED—Agents, machinists, toolmakers, draftsmen, attention! New and revised edition Saunders' "Hand Book of Practical Mechanics" now ready. Machinist says, "Can't get along without it." Best in the land. Shop kinks, secrets from notebooks, rules, formulas, most complete reference tables, tough problems figured by simple arithmetic. Valuable information condensed in pocket size. Price, postpaid, \$1.00, cloth; \$1.25, leather with flap. Agents make big profits. Send for list of books. E. H. Saunders, 216 Purchase St., Boston, Mass.

WANTED—AGENTS, this is your opportunity. A water filter attached to faucet, needed in every kitchen; sure seller; 100 per cent profit; sample, 25c; particulars free. Gem Mfg. & Supply Co., Dept. 31, La Jolla, Cal.

AGENTS—Sell Patented Radiumite Self-Honing Strop. Just being put out as an agency proposition. Strop covered by 16 patents. A \$2.00 razor given free with every strop sold. Strop retails for \$1.00. Millions being sold and agents coining money. Throw away old, worn-out propositions for something new and salable. F. J. Kling made 33 sales one Saturday afternoon in two hours. Outfit free. Thomas Mfg. Co., 904 Home Bldg., Dayton, Ohio.

AGENTS—\$75 monthly. Combination Rolling Pin. Nine articles combined. Lightning seller. Sample free. Forshoe Mfg. Co., Box 248, Dayton, O.

THE LIGHTNING MULTIPLIER POST CARD will solve problems in multiplication quick as a flash, with absolute accuracy. Indispensable to every person who uses figures. Cannot get out of order. Send for one, and you will wonder how you ever got along without it. Agents wanted. Sample, 10 cents in stamps. The Simplicity Co., Chicago.

IF THERE WERE NO TELEPHONES in your territory now, and you had the exclusive right of selling them there, your proposition would not be as good as one I have to offer you now, if you are the man or men. References First National Bank, Chicago. M. L. Pitner, 183-189 Lake St., Chicago.

AGENTS make big money selling our new sign letters for office windows, store fronts and glass signs. Anyone can put them on. Write today for free sample and full particulars. Metallic Sign Letter Co., 77 N. Clark St., Chicago.

MEDALLIONS SELL AT SIGHT. 300% to 500% profit. Make up your own goods and be independent. "It's easy." Catalog free. Fred Resag Co., 366 W. Randolph St., Chicago.

WANTED—Capable agents to handle new, high grade, up-to-date articles; lightning sellers in all homes, offices, stores, shops, \$3 to \$10 daily guaranteed. Promotion assured. Thomas Mfg. Co., 1301 Home Bldg., Dayton, Ohio.

\$3.60 STARTS YOU in good paying business or money returned. Selling ability required. Pleasant, congenial work. Be independent and secure a permanent business. The F. B. Black Co., 1209 Union Ave., Kansas City, Mo.

EXCEPTIONAL OPPORTUNITY for energetic solicitors with grit and selling power. Article absolutely new and guaranteed. Tremendous seller. Everybody buys if shown. 60c to \$2 profit each sale. Virgin field awaits hustlers everywhere. Write today. Sanitax Co., 2309 Wabash Ave., Chicago.

AGENTS to sell Dutch Cooking Set; sells every house. Write us. Pace Bros. & Sons Pottery Co., Roseville, Ohio.

NEW ART—Fascinating, rapid money maker. You can decorate china, burnt wood, pillow tops, anything, plain or colored from photographs. No talent required. Send stamp for information. D. L. Vallance Co., Elkhart, Ind.

WALL CLOTHES DRYER, Grand Seller. Particulars Free. Adjustable Clothes Dryer Co., Leipsie, Ohio.

JUST PATENTED, Young's Button Hole Gauge Knife. Nothing like it. Every woman wants one. One agent sold 107 at 25c each in one day, made \$13.37. Fifteen other useful rapid sellers. A. M. Young & Co., 10 Young's Bldg., Chicago.

AGENTS are coining money selling our great combination tool, the Washington Hatchet. Ten tools in one. Sells at sight to farmers, housekeepers, storekeepers, etc. We can show you how to make from \$3 to \$10 a day; experience unnecessary. Write today for our agents' offer. H. Thomas Mfg. Co., 120 Barney Block, Dayton, O.

SEND A DIME—coin or stamps—for a sample of "Just-Pull," the greatest electric light attachment on the market. A child can operate it. Easy money. No labor attached to the selling. Takes one minute to show it; can't get out of order; sells on sight for 25c. 100% profit. 2,000 sold to consumers at Chicago Electrical Show. Send ten cents for sample and full descriptive matter by return mail. Premier Novelty Company, Dept. A, 42 River St., Chicago.

WANTED—AGENTS: Capable men to act as exclusive agents to sell well known, high class, fuel and labor saving boiler specialty. Unlimited field. Excellent testimonials. Necessary on all boilers. Splendid opportunity for a man who can sell. Price, \$50. Liberal contract. Diamond Power Specialty Co., 234 Fort St. West, Detroit, Mich.

AGENTS. \$100 monthly easily made handling one or more of our 350 fast sellers. Scheff Co., 640 Wells St., Chicago.

WE MANUFACTURE GLASS PAPER. Plain glass windows made to look like real stained glass. Easily applied. Something new for agents. Big money maker. Sells on sight. Samples of this paper with catalogue in colors sent on receipt of 10c. S. H. Parrish & Co., Lakeside Bldg., Chicago.

MERRY WIDOW HANDKERCHIEFS. The joke of the season. 'Nuf said! 25c, postpaid. Ewing's, Decatur, Ill.

IN SIX MONTHS a boy made \$1,000 with our great Soap and Toilet Combinations. Be a Davis agent—work six hours a day—make \$200 a month. Get our profit sharing plan. Davis Soap Co., 80 Union Park Ct., Chicago.

AGENTS: Our Dashboard Line Holder will make you rich. Just shipped Texas agent 10 gross, being 3rd order in 30 days. Sample, 30c, silver, prepaid. Wholesale Supply Co., Dept. 15, Valdosta, Ga.

STIKPATCH MENDS STOCKINGS quicker and better than darning, wears longer, will wash. 20 patches, 10c, postpaid. Agents write for terms. Excellent profit. Sells on sight. The Stikpatch Co., Box 3294, Dept. C, Boston, Mass.

AGENTS: Your opportunity. Start now. Mr. Carroll made \$250 in one month. So can you. Household articles, batiron shoes, Wilson's dress books, keyless doorlocks, etc. Get busy. Dexter Supply Co., 332 Dearborn St., Chicago.

WABBLE CURE NUTS make old buggies run like new. Big commission. Special introductory offer. Also dollar adding machines. Hardware Company, Pontiac, Mich.

AGENTS—Make big money metalizing flowers, leaves, insects, etc., at home. Big sellers. Original formula, 25c. Etna Novelty Co., Box 134, Seattle, Wash.

AGENTS—STEADY EMPLOYMENT, taking orders for fruit and ornamental trees, plants, etc. Experience unnecessary. Highest commissions payable weekly. No delivering or collecting. Outfit free. Perry Nurseries, Rochester, N. Y.

AGENTS to sell St. Patrick's Day Pipes and Postal Cards. Samples by mail, ten cents. Hanson Co., 410 East 147th St., N. Y. City.

AGENTS—I have twenty extra good receipts for making salable goods. Enormous profits. Write for list. E. Stover, Mt. Sterling, Ill.

AGENTS WANTED to sell beautiful cloud effect Post Cards. Send 25 cents for proposition and samples. Peer Locke, Victor, New York.

JUST OUT—Low-priced, 3-lb. mop; turn crank to wring; clean hands; women all buy; 150% profit; catalog free. U. S. Mop Co., 271 Main St., Leipsic, O.

WANTED—Live agents and mail order people to handle "Ouida's" Toilet Specialties. Liberal terms given. Woepel Co., Box 819, Buffalo, N. Y.

AGENTS, LOOK! Women and Men. We have just added four new big sellers. Rockford, Ill., agent worked 3 days, then ordered 100 doz. Write for particulars and \$2 free offer. Fair Mfg. Co., Box 143, Racine, Wis.

MEN AND WOMEN, to introduce our famous home remedies; \$1.50 a day in spare time, also valuable premiums; we ask for no money. Elkhurst, Room 4, Tyrone, Pa.

AGENTS—New invention; never sold in your territory. Coin money. Everybody wild about them. Sells on sight. Those getting territory will make a fortune. Free sample to workers. Write at once. Automatic Co., L231, Cincinnati, Ohio.

AGENTS. Make \$15 to \$25 per week with the best side line on market; outfit free; will not interfere with your other work. Quality Printshop, 2635 East 42nd Ave., Denver, Colo.

AGENTS—Harrah's Manual on cleaning, how to take out all kinds of spots and stains out of cottons, silks and woollens; how to press your clothes and hundreds of other secrets; 80 pages; copy by mail 50c. Home Dry Cleaning Co., Litchfield, Ill.

AGENTS WANTED—For an illustrated Catholic family magazine. A dollar on every order. Write for particulars, inclosing references. Magazine, Magazine, Box 1077, New York.

AGENTS to handle our new high grade up-to-date articles; lightning sellers everywhere, \$3 to \$10 daily guaranteed. Send 12 cents for samples and full particulars. Thompson & Co., 2233 Wabash Ave., Chicago.

AGENTS WANTED—We want a few good, live agents for the Excelsior Auto-Cycle, the best made and best advertised motorcycle on the market. We want established agents; no curbstone brokers. See ad page 138, Agents' Department. Excelsior Supply Co., 233-237 Randolph St., Chicago, Ill.

FREE SAMPLE: Large Illustrated Catalogue agents' goods, 10c; red-hot sellers. Pierce Supply Co., Fremont, Neb.

MONEY SHOWING our Cardboard Signs, Price Card Tickets, Changeable Signs and other novelties to business men. Show the goods, they sell themselves. Send 20c for agents' sample outfit, postpaid. Don't miss this opportunity. Michigan Novelty Co., Detroit, Michigan.

SIGN LETTERS for store and office windows. Easily applied. Five different kinds. Catalogue free. P. Johnston Mfg. Co., Quincy, Ill.

YOU CAN OWN your own business. Start in spare time; be independent; no capital. Complete instructions for silver quarter. H. C. Annable, 188 Essex St., Salem, Mass.

AGENTS send 15c for samples, prices and a grand good selling plan of Adams' high grade toilet and household specialties. Adams Supply Co., Box 2343, Boston, Mass.

AGENTS—Stamp names and addresses on key checks, name plates, watch fobs, etc. We supply blank stock and stamping outfits. Sample free. Hart Manufacturing Co., 80 Guernsey St., Brooklyn, N. Y.

AGENTS—Necessity for every store. Manufacturer, 85 Water St., Brooklyn, N. Y.

AGENTS—Titus stocking darning fits any sewing machine; wonderful seller; sample 25c. Write Titus, inventor and manufacturer, 138 Liberty St., N. Y. City.

MALE HELP WANTED

SALESMEN—We want a wide-awake man in every city, town and village to act as our representative and look after new and renewal subscriptions to Practical Engineer, the popular power plant monthly. Read exclusively by the Superintendents, Engineers, Asst. Engineers and Master Mechanics of stationary steam and electric power plants. Subscription price, \$1 a year. You can devote all or part of your time to the work and make big money. See display ad. on page seven of this issue, then write for our liberal offer to agents. Technical Publishing Company, 337 Dearborn St., Chicago, Ill.

WANTED—Railway Mail Clerks, Customs Clerks, Clerks at Washington. Commencement salary, \$800. Many March examinations. Common education sufficient. Candidates prepared free. Write immediately for schedule. Franklin Institute, Dept. C22, Rochester, N. Y.

AGENTS WANTED for our new 25c Darning Machine; just out. Weaves new heel or toe in sock in a few minutes. One agent sold 288 in one day. Send 15c for sample or \$1.25 for doz. Hutton Co., Walnut St., Desk 2, Philadelphia, Pa.

WANTED—High-class men as General Sales Agents in several important territories to organize sales force. Article new; widely advertised; appeals to best consumers. Splendid opportunity for men of ability. Give full details. Progress Co., 160 Adams St., Chicago.

ANYBODY—EITHER SEX—can make \$4 daily entire year raising mushrooms for hotels and restaurants with my spawn, in cellars, sheds, boxes, etc. Free illustrated instruction booklet D. Hiram Barton, 329 W. 48th St., New York.

SALESMEN wanted everywhere; big pay, exclusive territory free; four-cent water gas without changes in any heat or power plant; write quick. Kol-Saver, Glen Ellyn, Ill.

WANTED—Reliable stock salesmen in every town in Kansas. Easy sales. Address W. F. Bellman Investment Co., Topeka, Kan.

WANTED—Railway Mail Clerks. Commencement salary, \$800. Examinations soon. Preparation free. Franklin Institute, Dept. C22, Rochester, N. Y.

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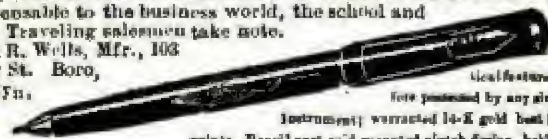


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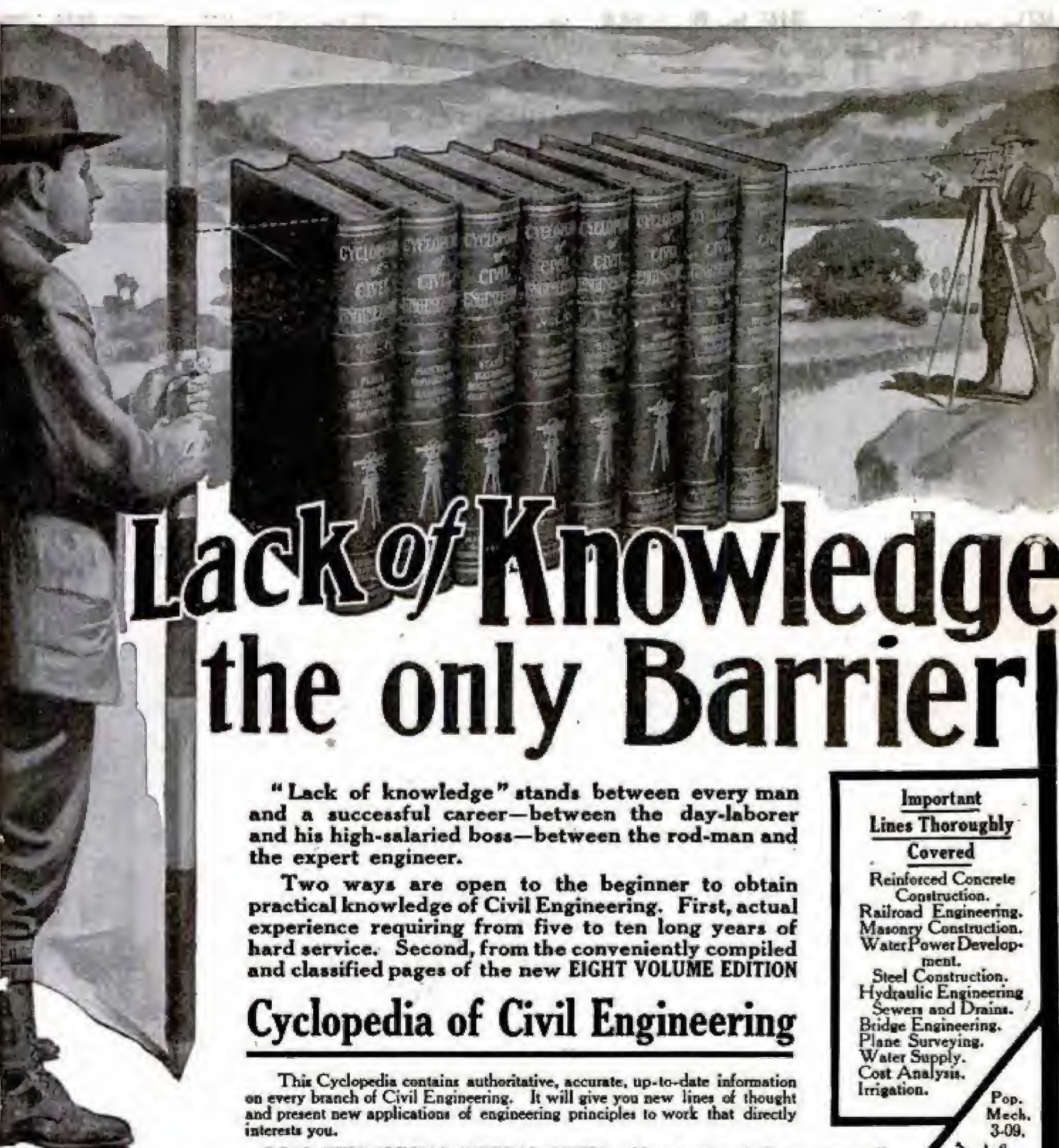
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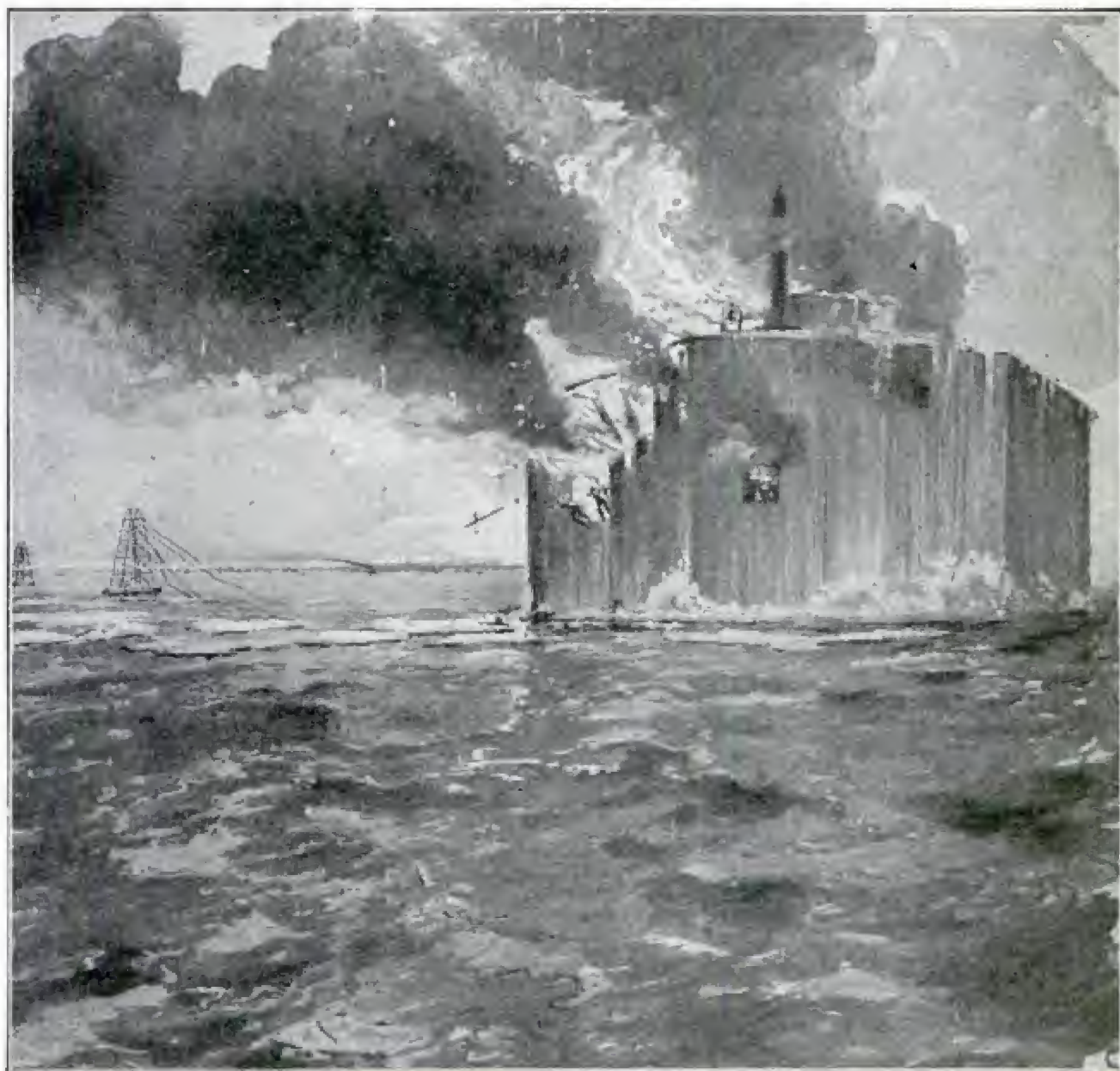
Vol. XI.

MARCH, 1909.

No. 3

CHICAGO'S HORRIBLE CRIB DISASTER

Nearly 70 Workmen Were Either Burned to Death or Drowned—Forty-Six Were Burned, Frozen, or Both, Before Being Rescued from Lake Michigan's Icy Water

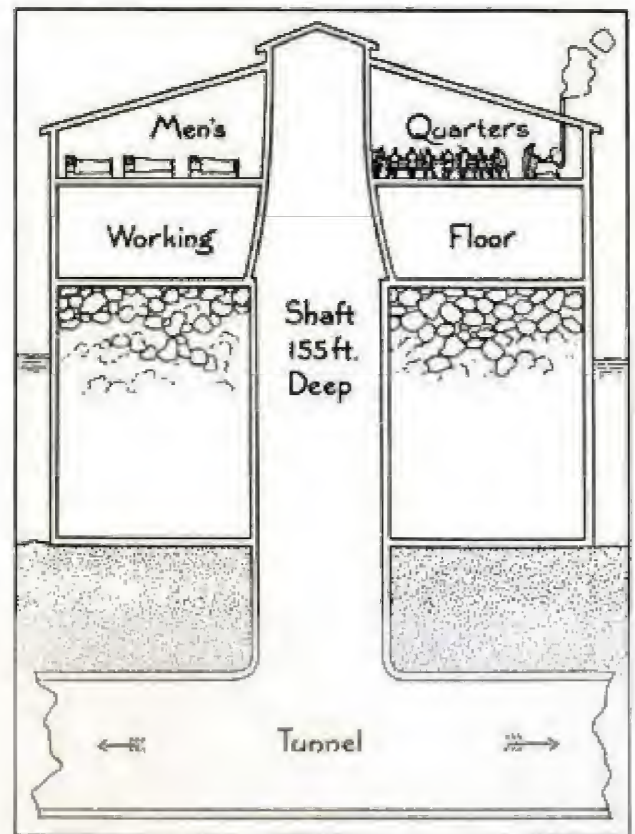


A few moments after 8 o'clock, on the morning of Jan. 20, a fire broke out in the intermediate crib of the great tunnel at Seventy-third street, which, extending four miles out into the lake, is designed to furnish water

to the southern section of Chicago. The shaft of the tunnel, constructed of steel sheeting, extends from 10 ft. above the surface of the lake to the rock formation which lies beneath it, a depth of 155 ft. Around and over the top of

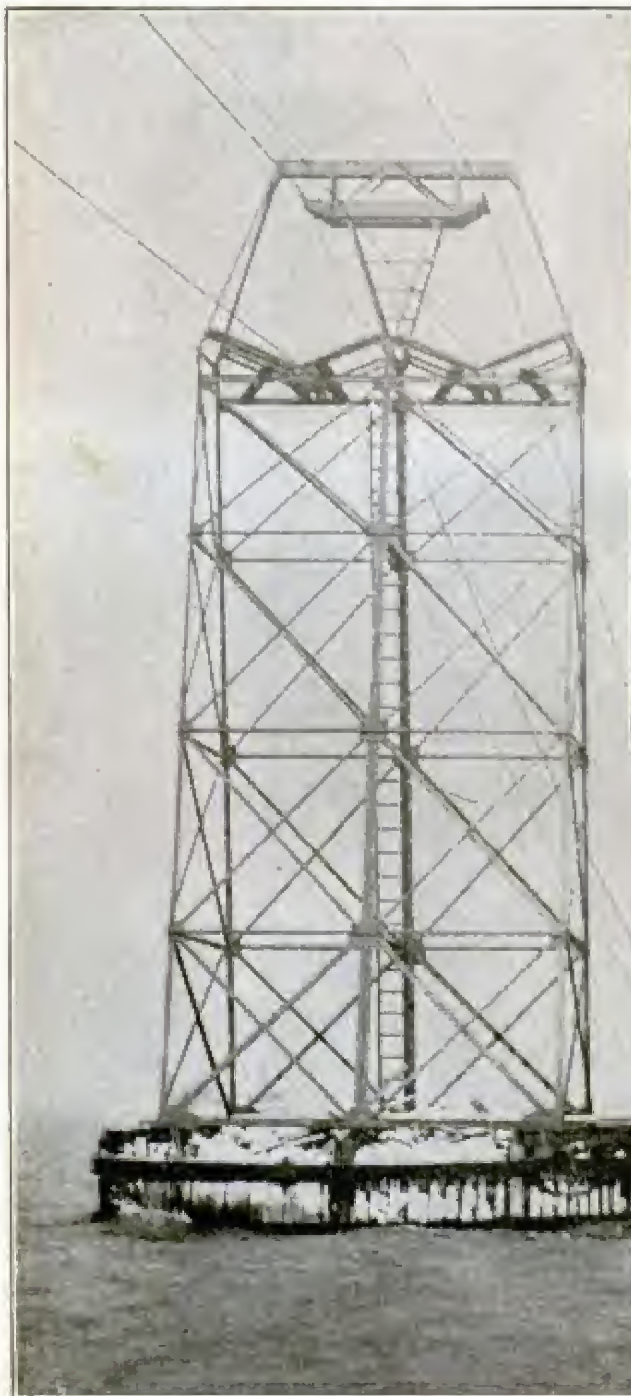
this shaft was the hexagonal-shaped wooden structure in which 116 or more men (the estimate varies) were quartered.

Comment on the planning and construction of this crib, which was considered one of the best equipped ever used for such a purpose, is unnecessary. The photographs, showing how it appeared before the disaster, speak for themselves. No boats of any kind were at hand, and the aerial cable-way, its only connection with the shore 7,500 ft. distant, was out of commission three minutes after the fire started.

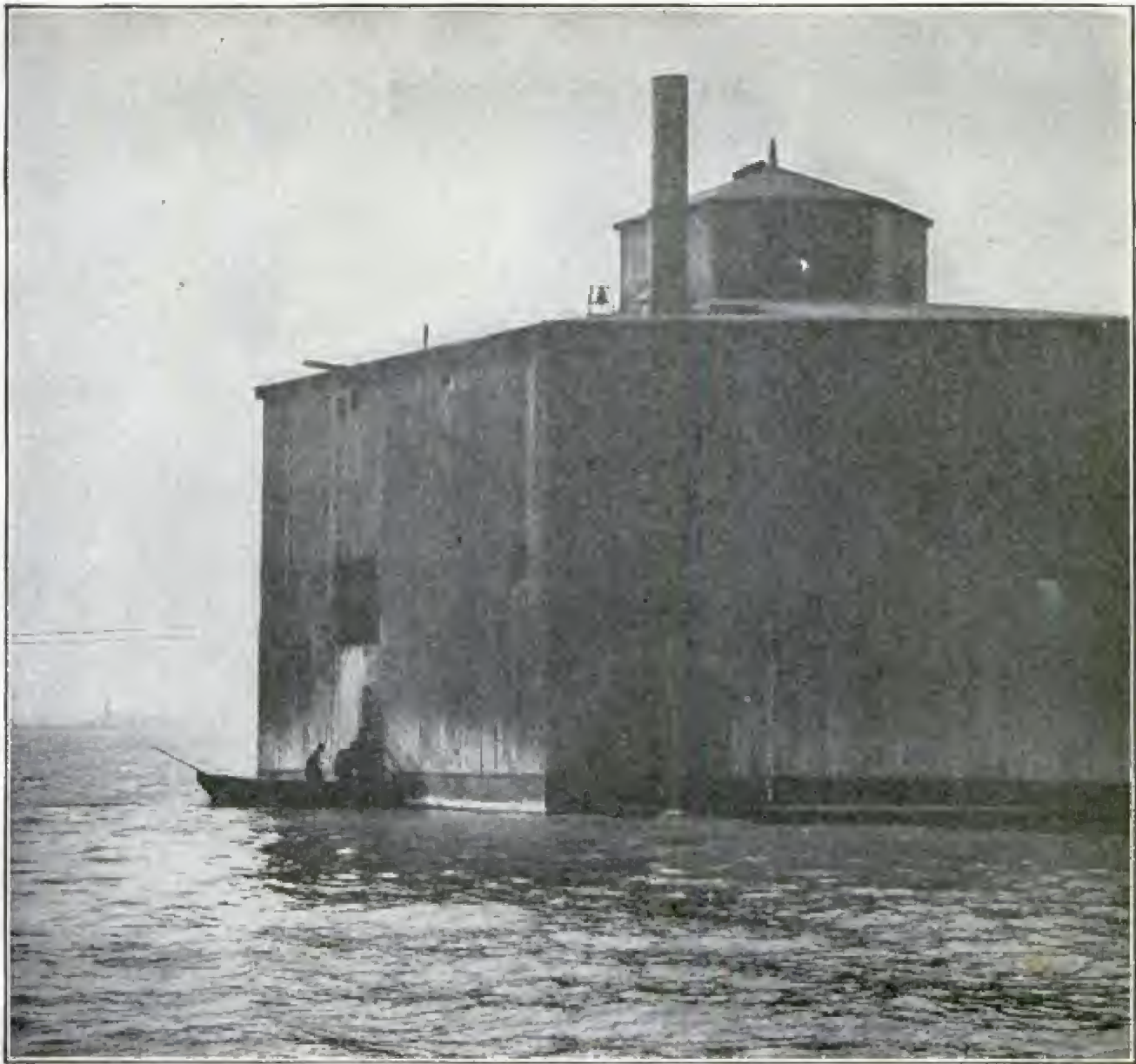


Front Elevation of Crib

When the cry of fire echoed through the huge upper floor of the wooden structure, most of the men were at breakfast, seated at long tables. It was between the shifts, and one set of men had just come up from the tunnel. Many of the night men, tired from their eight hours of toil, had taken a hasty meal and were already half undressed. No sooner was the warning sounded than all was confusion. Wild



One of the Steel Towers of the Cableway—Built to Transport Workmen Between Crib and Shore, 7,500 Ft. Distant



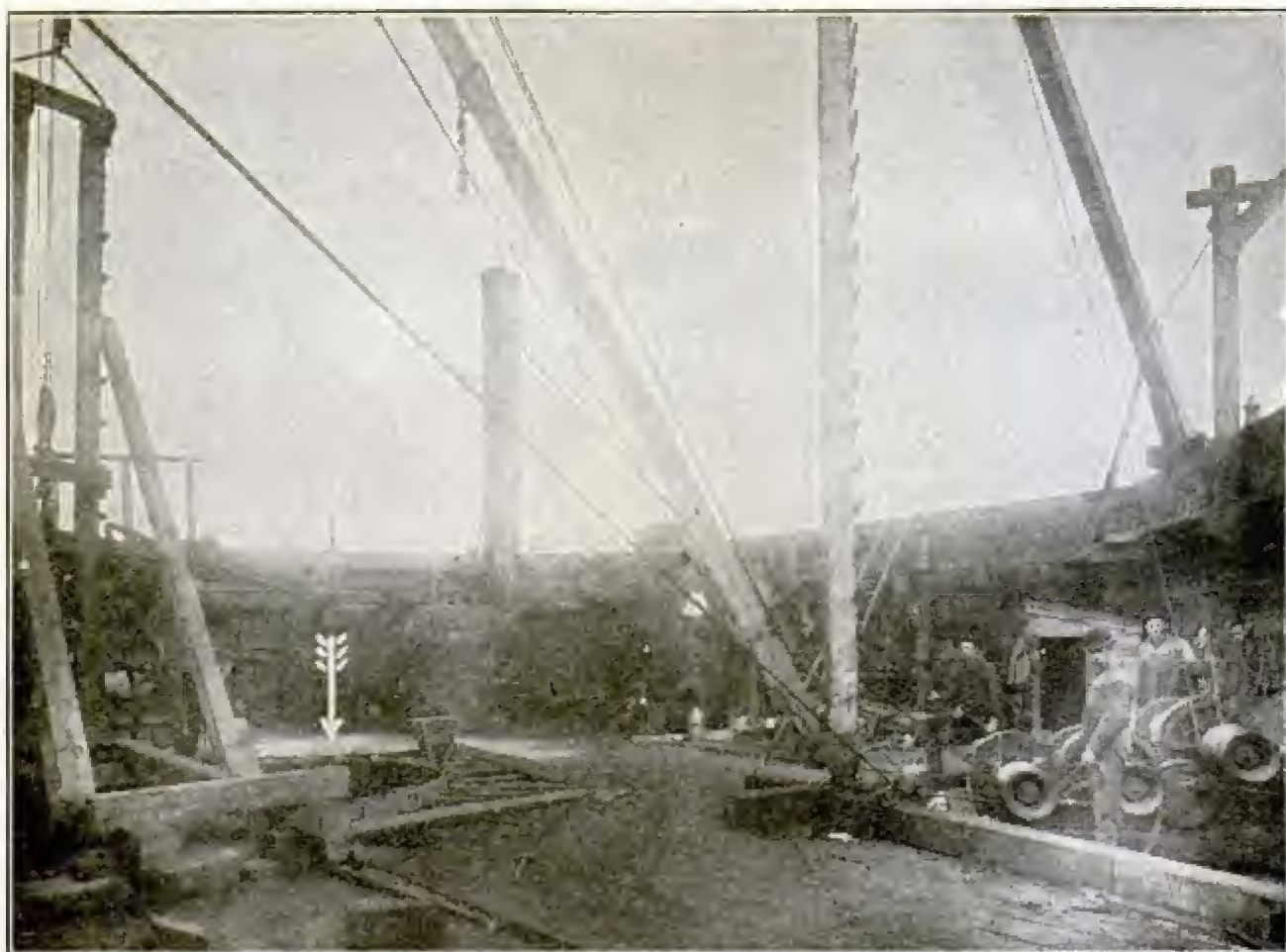
From Photo of Crib Taken a Few Weeks Before the Fire

cries greeted the appearance of tongues of fire licking at the wooden walls. Puffs of smoke rolled in at the doorways, and almost before the men could rush from their seats the flames surrounded them in all directions, seeming to be lighted simultaneously in 50 places. A few windows and the cableway entrance, offered the only way of escape. Some struggled onto pieces of floating ice, where they were picked up by rescue tugs. Others sank to their death, but the majority had not even the opportunity to choose drowning in preference to burning.

When it was all over, 47 headless and limbless bodies, burned beyond all recognition, were lifted into canvas bags, and buried later in one common grave, mourned over by wives, mothers, and

children, none of whom knew in which coffin rested all that remained of their own loved one. Divers searched for the bodies of the men drowned, finding many of them, but up to the time this article was written, the list of missing was much larger than the list of bodies recovered. Forty-six men were all that survived, and of this number all were more or less burned or frozen, or both.

As near as could be determined at the inquest the fire started in the powder room, in which 1,000 lb. of explosive was stored. Three of the survivors claim that they saw a colored workman with a lighted torch in his hand enter this room shortly before the fire started. The fire was not attended by an explosion, the dynamite simply burning away.



Crib During Construction—Arrow Points to Shaft

FIREWORKS AS AIRSHIPS' ENEMY

While the ordnance officers of the different powers are racking their wits to devise some method of repelling a bombardment from airships, H. J. Pain, the famous maker of fireworks, sits in his office, smiles, and says, "Why not use fireworks?"

"Why bother about shells fired from cannon," asks Mr. Pain, "when there are skyrockets able to soar a mile and explode up there? Why worry about searchlights when there are aerial torches which will burn for an hour and illuminate an area of 10 miles' radius? Why talk of fortifications when there are deadly gases which can be spread in great strata above the earth?"

Estimates of the standing timber in the United States range all the way from 822,862,000,000 to 2,000,000,000,000 board feet, a difference of more than a trillion feet in the estimation of the best qualified authorities.

AERONAUTIC CORPS AS PART OF STATE MILITIA

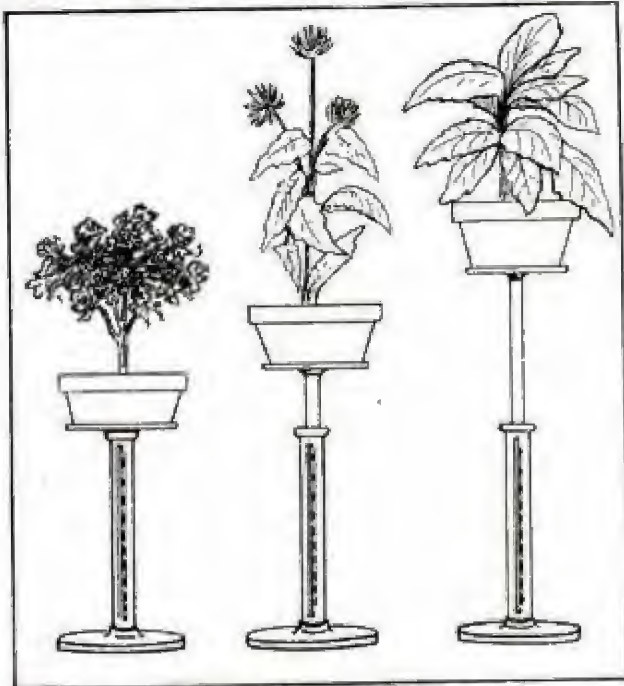
A movement is on foot in Milwaukee, Wis., to organize an aeronautic corps in connection with the Wisconsin State Militia, its members to study aerodynamics and to experiment with heavier-than-air flying-machines. Such a corps, according to Dr. Rudolph Silverstone, an airship inventor and a member of the Milwaukee Aeronautic Club, would be subject to the orders of the secretary of war should the need occur.

The idea is looked upon with favor by some of the department officials at Washington as a means in time of war of adding to the efficiency and size of the corps which will direct the aerial warfare of the future. In all probability the next few years will find just such a corps as part of the militia of many of the states.

The tonnage of U. S. battleships and armored cruisers is 607,241; that of England, 1,395,930.

AN ADJUSTABLE PLANT STAND

These adjustable plant stands, manufactured by a Pennsylvania concern, make possible many artistic arrangements or groupings of flowering and

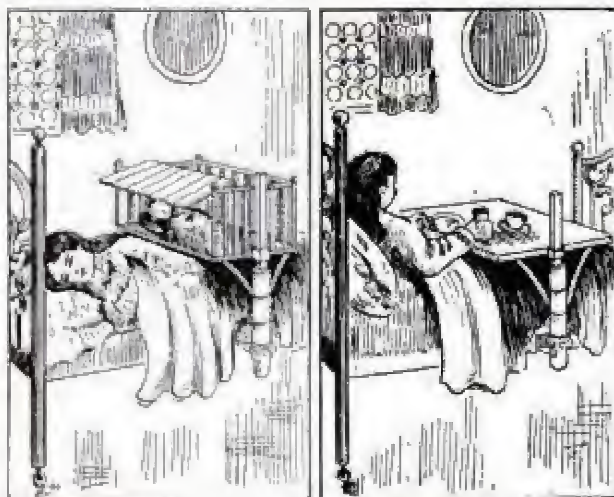


Adjustable to Various Heights

foliage plants. The stands are made of galvanized iron or oxidized copper, in three sizes. They can be adjusted at any height from 6 in. to 48 in.

TABLE AND CRIB ATTACHMENT FOR BEDS

The table and crib attachment shown in these illustrations was recently patented by a Lakewood, Fla., inventor, who believes his device will fill a much required need. The drawings showing both the crib and table explain themselves. The attachment is adjustable



Crib and Table Combined

and can be raised to any height. No tool of any kind is needed to fasten it into position and it can be slid back and forth as desired.

FRETTED SILHOUETTES

The new method of making silhouette photographs, now the fad in London, is a great improvement over the old, the outlines or edges of which were hard



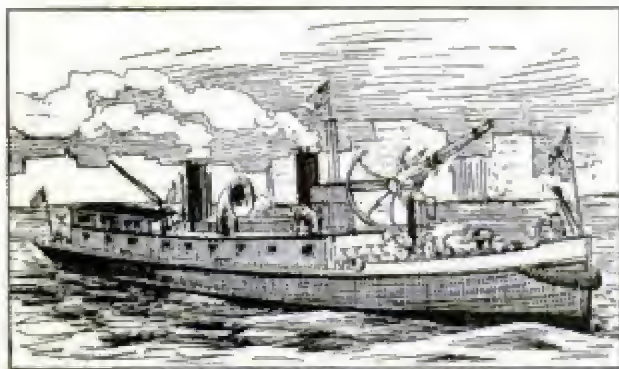
Silhouette with Soft Outlines

and sharp. By the new method the outlines are soft, almost transparent, as shown in the illustration.

LONDON'S LATEST FIREBOAT

The powerful steam fire pumps and other fire-fighting apparatus of the "Beta," the latest addition to London's fire-fighting fleet, makes that vessel one of the most powerful of its kind in the world.

The water pressure is furnished by



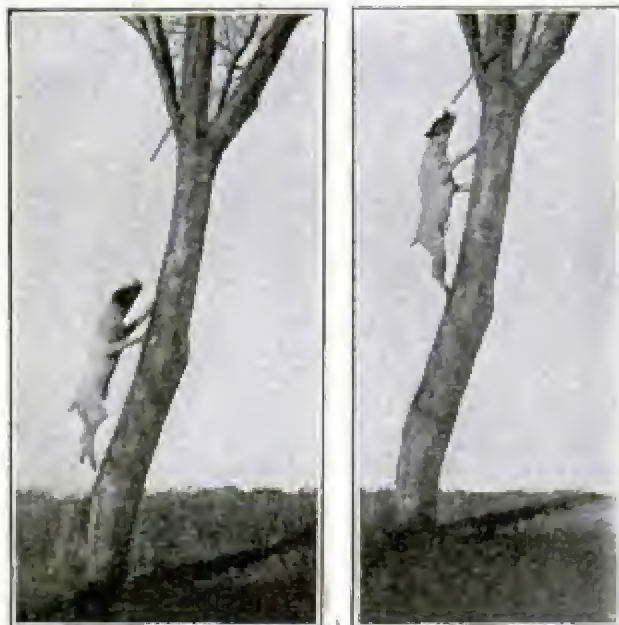
London's Fireboat "Beta"

four pumping engines, each of which will deliver 1,000 gal. per minute at a pressure of 140 lb. to the square inch. These engines are so arranged that each can be worked separately, or two, three, or four together. The pumping capacity in the latter case is 4,000 gal. per minute, or roughly speaking, 900 tons of water per hour.

The fittings on deck include a large monitor nozzle of new design, which will take the full combined capacity of the pumps, and through which a powerful stream of water can be hurled a distance of more than 300 ft. Two smaller monitors of a similar design are capable of taking 1,200 gal. per minute each, and in addition to these are eight separate delivery outlets to which lines of hose can be connected.

QUICK WORK WITH CAMERA

These two photographs of a dog climbing a tree show excellent and



Tree-Climbing Dog

quick work with a camera. The exposures are good, considering the fact that the dog was moving rapidly—Contributed by Harry Phelps, Tecumseh, Neb.

MAIL BOX IMPROVEMENT

The new U. S. mail boxes in California have an arrangement which tells



Announces Next Mail Collection

when the next collection will be made. It works automatically, the opening of the box by the mail carrier turning a cylinder on which letters and figures are arranged.

PARISIAN DOCTORS MAY WEAR SIGNS

The Paris medical society is considering asking physicians to wear badges in the streets and public places so that they can be easily found in case of accidents. It is not infrequent for a person, in need of medical aid, or acting as messenger for someone who is, to run for blocks before encountering a doctor's sign, and at any time he might unknowingly pass a physician.

THE WORLD'S GREATEST DISASTER

All Nations, Led by the United States, Assist Italy—U. S. Government Sent Building Material for Several Thousand Houses in Devastated District—
Supposed Causes of Earthquakes—The Arch Never Sleeps



Removing the Dead—Messina

Nature is not gentle in her method of geological reconstruction, and as a result the world witnessed its most terrible disaster in the earthquake which changed sunny, smiling Sicily and the province of Calabria in southern Italy into a devastated, fire-blackened waste. The story of the quake, the estimates of the dead, ranging from 150,000 to 250,000; the destruction of millions upon millions of property value, the instances of great heroism, and the aid extended to stricken Italy by the peoples of every civilized country, are too well known through the press to need reiteration here. But in among the details of death and destruction, so overwhelming as to make them almost unnoticeable, can be found the part played by the mechanical and the slow but methodical marshalling of the mechanical agencies which will be used by the hu-

man intellect in the attempt to sweep away the ruins and build again where nature wrecked. The scientific side of the earthquake also did not receive much space, being crowded out by the recording of the world's great display of International brotherhood.

The first great tremor which leveled city upon city also uprooted telegraph poles, breaking all connection with the outside world. For hours no news came from the stricken districts, then a few words filtered through here and there, barely telling to the world that nature had shaken a part of the foundation upon which humanity exists. A small torpedo boat scurried from port to port along the coast of Sicily in what, for a long time, was a vain attempt to find telegraphic connection with the outside world. At last the details of the disaster began to break



The Water Front, Messina—Before the Quake

the ominous silence, and to a great extent this was through the medium of the wireless equipment on the battleships in the Mediterranean. Soon after the tremor the grey shapes of English, Russian, and Italian battleships crept up to Messina and the work of rescue commenced.

Interesting feature after feature can be given of the work of getting aid to the injured, but to the American—and

the United States can be proud of the millions it sent—the sailing of the “Celtic” was accomplished with a speed that calls for enthusiasm. No better example can be given to show how governmental tape can be torn away and quick action made possible, when such is required. It is true that the “Celtic” was partly loaded and nearly ready to sail as a “Christmas Ship” for the “Battle Fleet”, but the dispatch with which additional supplies were placed on board was extraordinary. The quake occurred on Dec. 28. It was two nights later before news, attesting the extent of the needs required, was received. On that night the plan for sending the “Celtic” to Italy instead of to the fleet was conceived, and the next day the ship sailed.

Through the first two weeks following the quake the United States government and the people from every section were quick in extending aid in the form of money. Every city raised its thousands for the relief fund, and smaller towns and villages contributed their share, but the United States government can be given the credit of being the first country, outside of Italy itself, to formulate and put into effect a plan for helping to rebuild the stricken cities. By January 15 money was



Water Front, Messina, After the Disaster



Surgeons Operating on Emergency Cases in the Street

plentiful in Italy, but material for rebuilding was scarce. The United States government, which had voted \$500,000 in addition to the supplies sent on the "Celtic," therefore planned a program for sending material to construct a large number of small houses or sheds to shelter earthquake sufferers. Secretary of the Navy Newberry busied himself waiving aside all red tape, and two hours after the order reached New York the first ship had been chartered and was being laden with material. The first vessel carried material for 500 houses, and four head carpenters to take charge of the construction. Other vessels were also chartered by the government and two or three weeks later all were on their way to Italy with material enough for several thousand houses. This was the start in making the devastated region again habitable.

The scientific side of the earthquake is also compellingly interesting. There is no completely satisfactory theory of the origin of earthquakes, but the "tectonic theory" is the most probable. This may be illustrated simply by reference to a well known maxim of architecture: "The arch never sleeps." By this, architects mean that when construction work is formed on an arch, the arch is always in a state of strain. It never sleeps. Time, decay, or accident may always overstrain it and bring about a collapse. The whole earth is continually subject to the same kind of strain. It is like a very tightly wound core of a ball that is badly made. The weights of its parts are not well adjusted. The weight of the earth as a

whole is very much greater, proportionately, than that of its surface rocks, and its rigidity, as a whole, is also greater than that of any geological strata. Therefore, there is always a tendency to readjust its parts, and this adjustment usually occurs where high mountains and great ocean depths are neighbors. Under very great pressure, iron, and even steel, can be made to flow like thick cream. It is supposed that under the crushing weight of the strata piled up on high mountains, the subterranean rocks become fluid, and that on this insecure support—as on an overstrained arch—there may be a sudden collapse.



Ruins of a Mansion



Sailors Removing Injured

The simplest theory of all, and one that has existed since the time of the early Greeks, is that the water from the sea, as from great lakes, and the deltas of great rivers, penetrates the surface rocks and find its way to the red-hot or molten rocks, where it is turned into steam by the heat. When the pressure of steam becomes too great, an explosion occurs, and the earth's crust is shaken and cracked.

The instruments which record a great earthquake in all parts of the world are truly wonderful. At some 80 observatories scattered all over the world these earthquake-recording instruments, seismometers and seismographs, are set up. The more important earthquake records traced by these instruments are sent from all over the world to Mr. John Milne's central observatory on the Isle of Wight. By comparing these records Mr. Milne can calculate the place or origin of the earthquake in the following manner: If the shock reaches the Paris observatory before it reaches the Berlin observatory, evidently the earthquake wave is traveling from west to east and originated west of Paris. When the seismograms arrive from several other stations, east, west, north, south, then, by comparing the times at which the earthquake reached them, the place of origin of the wave can be determined with great accuracy.

The earth waves which originate at the centers of powerful earthquakes and are extended to great distances,



Railway Car Ferry—Messina Straits—Messina in the Distance—Photo Was Taken Only a Short Time Previous to the Earthquake



This Scene Was Sketched on the Spot by Riccodo Pellegrini, Special Artist of the Illustrated London News

12,000 miles for instance, appear to travel at the rate of about a mile and a half to a mile and three-quarters a second. The first shock of a very distant earthquake is followed by after-shocks, which in some instances seem to bear a resemblance to the ripples which are reflected when the ripples made by throwing a stone into a pond of water reach the sides. A larger number of earthquakes travel towards the west, or against the motion of the earth, than towards the east.

THE HULL OF A "DREADNOUGHT"

A vast amount of material enters into the making of a great 20,000-ton battleship, four of which are now being constructed or are contracted for by the U. S. navy. The specifications for the "Florida," which is one of them, call for 8,907 tons of material for the hull alone, an amount equal to all of the material from keel to fighting-top in warships of the "Brooklyn" class. Of this amount of material 5,370 tons is steel plating, 2,757 tons is for shapes, angles and channels; 480 tons is rivets, ranging from $\frac{3}{8}$ to $1\frac{1}{4}$ in. in diameter; and from 200 to 300 tons is steel castings,

ranging in weight from 2 to 16 tons each.

A fine way to beat rugs is to lay them on an old bed spring and the dust beat out will fall through the springs.



Courtesy the Sphero

Ruins of Cathedral, Messina

WIRELESS TELEGRAPH AVERTS GREAT MARINE DISASTER

**White Star Liner "Republic" Rammed in the Fog
and Sinking Sends Wireless Messages Broad-
cast Over the Ocean—U. S. Government
Vessels and Trans-Atlantic Liners Many
Miles Distant Come to Her Rescue—
More Than 1,500 Persons Taken
Off Both Vessels**

Wireless telegraphy, only a couple of years ago looked upon with skepticism so far as practical results were concerned and classed by the layman as a weird something whose benefits to humanity were vague and erratic, has been gradually asserting its wonderful usefulness in a manner which has forced enthusiastic homage from the most phlegmatic, but never in marine history has there been anything more dramatic than its demonstration in the "Republic" accident.

The White Star Liner "Republic", bound for the Mediterranean, was cut down in a dense fog before dawn on Jan. 23 by the west-bound steamer "Florida" of the Lloyd Italiano line. Sixty-five miles from shore the stricken steamer flashed electrical calls for help broadcast over the ocean. From ocean and from harbor the answers came, and every trans-Atlantic racer within a radius of 100 miles, government vessels in harbor, and tugs from seacoast cities, sped to the work of salvation. Helpless and alone in the black fog, except for the crippled "Florida", with the sea pouring in its crushed side, although valiantly beaten back for many hours by the bulkheads, the "Republic" managed to tell her story so briskly and clearly that within a few hours after the collision off Nantucket lightship assistance was assured and the world knew all was well. By nightfall the wireless, whispering message after message, had told in illuminating dots and dashes the tale of what had happened, and capped the most wonderful story that has come from the sea in many years by telling the world that passengers would be brought to New York by the big "Baltic", a sister ship that came out of the mist at the call.

Ten years ago, before ships could talk with each other and the land, and the wireless had established news routes on the ocean, such an accident might have caused the "Republic" to go to the bottom without the world knowing of the disaster for days—perhaps never at all. But the "Republic", equipped with the Marconi apparatus, still reeling from the shock of the collision was able to tell its plight to land and sea within 10 minutes after it had been cut down. Minute after minute the calls were sent out, reaching the big "Baltic," "La Lorraine" of the French line, the "Lucania" of the Cunard line, and by land stations transmitted to the U. S. revenue cutters "Gresham" and "Acushnet", and the U. S. derelict destroyer "Seneca".

Later the passengers of the "Republic" were transferred to the "Florida", which had stood by, and although seriously damaged herself, was not in as bad condition as the "Republic". Still later another transfer was made from the "Florida" to the "Baltic", and this time it meant the carrying of more than 1,500 persons from one ship to the other in small boats, the passengers of the "Florida" being added to the list.

The efficiency of the system of airtight bulkheads with which all great modern ships are equipped is clearly demonstrated by the fact that the "Republic", with the huge rent in its hull, stayed afloat two days and a night before sinking in 40 fathoms of water. A comparatively few years ago a ship like the "Republic" would not have floated 10 minutes after receiving such a blow.

After using a gas range oven leave the door slightly open for about two minutes. The heat of the oven combined with the air circulation will help to dry it out.

The cabin boy has become practically a thing of the past.

The United States annually exports 1,000,000 bbl. of flour to Holland.



AUTOMOBILE GRADE TESTS

The accompanying illustration shows the testing of an automobile on a 40 per cent grade, all of the most important manufacturers of touring cars now making thorough tests of braking mechanism and starting on high and low gear at various grades, and this is of the greatest importance and of far more value to the ordinary automobile user than tests of high speed. The hill climbing contest gives the most valuable information as to the power and security which any car provides.

BILLIARDS ON BOARD SHIP

A London inventor has devised an ingenious billiard table, the actual playing surface of which moves with the motion of the sea and maintains a perfect level, thus making it possible to play the game on board ship.

The table has a solid outside frame fastened to the deck, and has a top ledge which will not deviate from its fixed position. Within this is the table proper, and it is so devised that it will move in any direction, not quickly or easily by the touch of the hand resting on the cushions, but in accordance with the motion of the boat. With this it moves slowly and evenly, as if floating in an enclosed tank. This is made possible by mounting it on a central horizontal axis, and this pivot is itself mounted on a second pivot with the axis transverse to the first one. The



Pivoted Billiard Table for Ships

second pivot is carried in bearings which are secured to the deck, and by means of weights and dashpots (a pneumatic or hydraulic cushion for a falling weight) an easy, reliable motion is obtained. The shafts are all carried on ball bearings, and the outside casing is supplied with rollers, on which the inner or movable table works.

Experiments show that the table makes an accurate game possible under any conditions other than actual storms.

PAPER PLATES AND TABLE LINEN

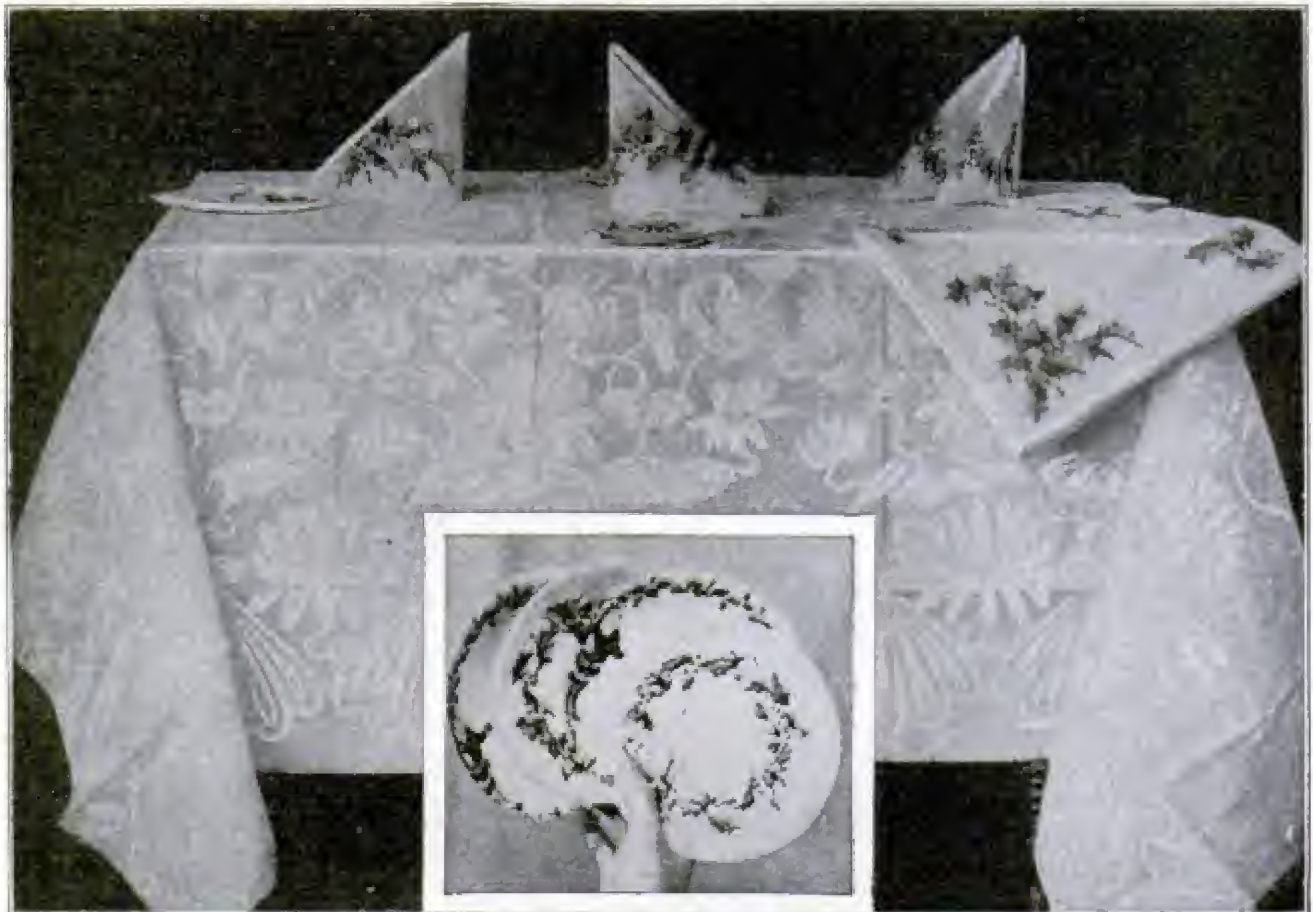
Tables can now be daintily furnished with such paper articles as cloths, napkins, plates of different designs and uses, and other dishes. The table-cloth shown in the illustration is of paper, although so close an imitation of the linen article that it looks exactly like it. Pattern and texture are there, and it is as dainty looking as a damask cloth. Its one drawback is in durability, but even this ceases to be a drawback when it is considered that it is

intended for only one meal and is sold at a low price.

The other illustration shows a set of six paper plates, artistically decorated with colors that will not come off. They are also intended only for one meal and are then thrown away.

HOW INLAID LINOLEUM IS MADE

Linseed oil is the only kind used in linoleum manufacture in Scotland. It is first oxidized and then boiled and mixed with gum until it has attained the consistency of soft india rubber, and mixed with ground cork. These materials are then pounded in a mixer, the process being practically dry mixing. The resultant material is squeezed onto the canvas foundation between steam rollers, the process lasting but a few seconds, and then it is ready for the pattern. The colors forming the pattern are laid onto the fabric by machinery. On the inlaid linoleum, in which the color goes through the fabric, hydraulic pressure is used.



Beautiful Designs in Paper Table Furnishings

SKINNING LIVE SNAKES

Very few of the people who are the proud possessors of belts, pocketbooks, card cases, and numerous other articles of snake skin, realize the agony that the demand of civilization for fads has meant to the original owners of the material from which these articles are made.

It is difficult to skin a dead snake, and the skin is often spoiled in the course of the operation, while, on the other hand, it is a simple matter to skin a live snake, and the skin thus gained is worth much more. Dead snakes bring from 2 to 5 cents, according to their size, and live ones from 25 cents to \$1.

One of the largest snake skin companies has factories in Sumatra, and it was there that the illustrations here shown were made. When a snake is received from a hunter it is seized adroitly by an operator, one hand squeezing the neck and the other holding the tail. It is then attached by the neck to the trunk of a palm tree, an assistant holding it by the tail. With the point of a knife the operator cuts the skin just below the head and pulling with all his strength peels it from the writhing reptile in the same way that a woman peels a pair of gloves from her hand. While this is taking place the assistant holds the body as rigid as possible.

The illustrations show the operation from the time the operator grasps the reptile until the finish. The skinned snake writhes in agony for nearly an hour before it expires.

FIRE DEPARTMENT ENFORCES SPEED ORDINANCE

The city officials of the suburb of a large western city, finding it impossible to enforce the speed ordinance by the ordinary methods, of which stop watches and officers stationed at the ends of measured stretches of road are part, invited the fire department to



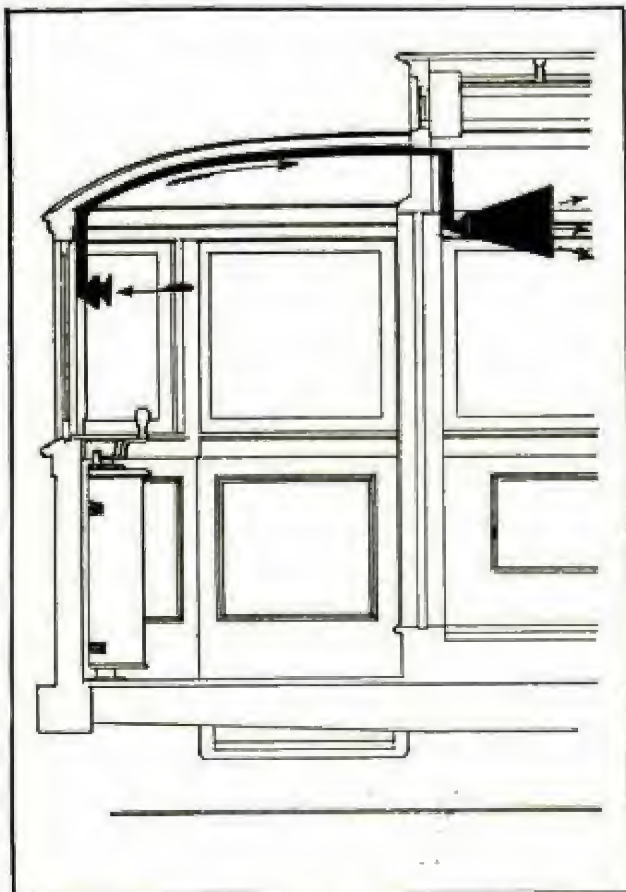
No Humane Society Protects the Snake

assist, and effectively quenched the enthusiasm of the auto-maniacs.

A line of hose was laid to the main thoroughfare at each end of the suburb and a fireman stationed at each. When the signal was received to stop an automobile the fireman in whose direction it was approaching stepped into the middle of the road, pointed the nozzle towards the machine, and held up his hand for the driver to stop. In no instance did the occupants of the speeding automobiles disobey the warning, but if they had, water would have been spilled.

MOTORMAN CALLS OUT THE STREETS

Some of the street cars in Atchison, Kan., are equipped with a device which makes possible the calling out of the streets by the motormen instead of the conductors. It consists of a tube running from the front vestibule into the interior of the car, where it ends in a sounding horn. The mouthpiece on the receiving end of the tube is fixed just above the control box, so that the motorman can



Speaking Tube in Street Car

call into it without moving or taking his eyes from the track.

ELECTRIC SHOE POLISHER

Many mechanical shoe-polishing machines have been invented within the last few years, but up to the present time the business of the ordinary shoe-shining parlors has not been seriously affected. This machine, however, is



Slot Machine Shoe Polisher

electrical, and a penny in the slot buys its services. The foot is placed in the box and the nickel is inserted in the slot. This action starts the motor. When the machine considers that the first shoe has received enough polishing, a bell rings. This is the signal to insert the other shoe. When the machine has given its customer his penny's worth of polishing, it quietly ceases to revolve, but it is an accommodating machine, and if the owner of the feet and shoes is dissatisfied with the result, another penny starts the brushes whirling again.

James Gordon Bennett has presented to the French Aero club an international aviation cup, valued at \$2,500, as well as three sums of \$5,000 each, to be given as prizes.



REMARKABLE RESULT OF A CYCLONE

The wreckage left in the wake of a cyclone can have no better illustration than this photograph of a demolished two-story brick schoolhouse taken soon after one of the not infrequent storms that occur in the cyclone districts of the United States. The most remarkable feature of the devastation is the position of the second floor, with nearly all of the desks and seats left attached. On the ground around the structure

are broken desks, jagged sections of brick, torn clothing, and even the remains of an umbrella.

CHINESE-AMERICAN ARCHITECTURE

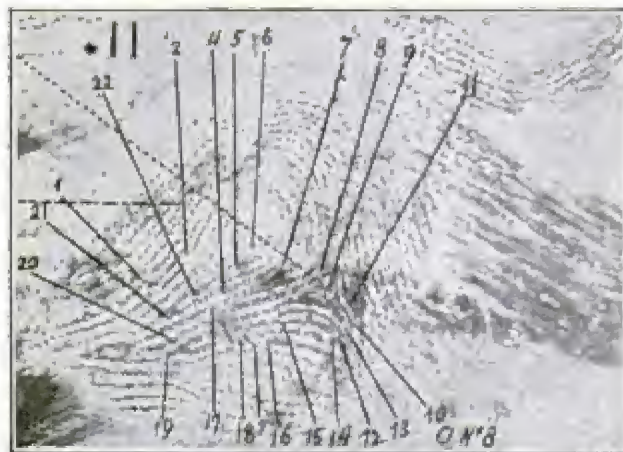
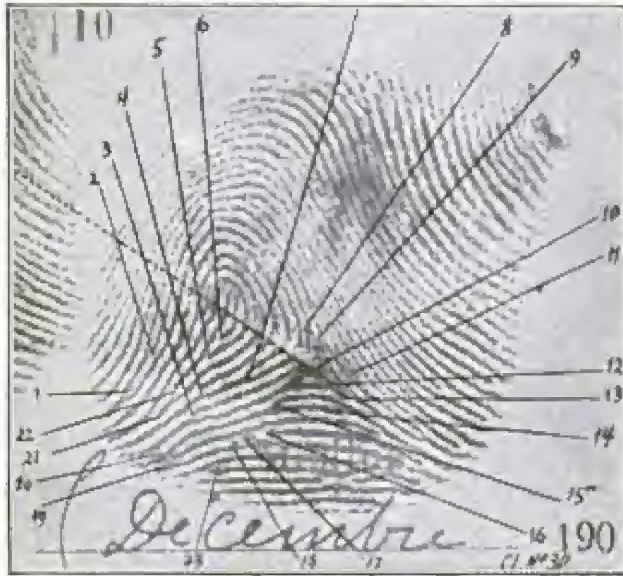
A new kind of architecture, of which this house is an excellent example, has made its appearance in California. It is an intermingling of American and Chinese architecture, and the result is remarkably artistic.



Chinese Effect in American Architecture

DETECTING CRIME BY FINGER PRINTS

In the investigations made by the Paris police and M. Bertillon follow-



Finger Print Found in Steinheil Murder Mystery—Finger Print on Cognac Bottle Handled by Murdered Man

ing the Steinheil murder, the excitement of which shook France, the finger prints shown in these illustrations were found on a cognac bottle and on a glass cover of a small clock that played a part in the murder. Such clues in the hands of M. Bertillon, whose system is so famous that it has been adopted all over the world, are sufficient to make the owner of the fingers that made the imprints tremble for fear of detection.

At first glance the bottle did not seem to carry any imprints but a closer study revealed a multitude of finger prints. Of these M. Bertillon easily identified the imprints made by the finger of M. Steinheil, the murdered man, and the imprints of the

fingers of the servant who carried the bottle to him. The method of identifying finger prints is quite complicated, but it is a known fact that the markings made by the fingers of different people differ as much as faces, and by taking the finger prints of a suspected person and comparing them with finger prints believed to have been left by the murderer or accomplices, it is possible to determine whether that person made them.

TO TEST THE FIGHTING MAST

The battleship "Idaho" will shortly leave the navy yard at League Island for a test of her new fighting mast, that is expected to revolutionize naval gunnery, preparatory to proceeding to Havana to salute the new executive at



This photograph gives a clearer view of the new lattice-work fighting-tops of the U. S. navy than the illustrations published with a descriptive article in the January issue. This ship is the "Idaho."

his inauguration at Havana. The new mast, which is the invention of the naval board of construction, is one of the simplest improvements in naval construction ever devised. It consists of a light iron framework 90 ft. high, at the top of which, secure from the smoke and haze from the guns below, which in the past have seriously interfered with the correct sighting of the guns, the fire control officer may direct the aim of the guns on the enemy. He will have an unobstructed view of the work of his own guns and can command with ease the whole fire of his ship during an engagement. It is claimed that the lightness of the iron framework will make them almost impossible to damage by shell fire and the framework is so arranged that such a thing as total destruction is out of the question.

PERFECT TOPAZ CRYSTAL

One of the largest and most perfect topaz crystals in the world has just been cut and polished at Avalon, Santa Catalina Island, and has been valued by Douglas B. Serrett, Jr., of Washington, at about \$10,000. The sphere measures 6 in. in diameter. The rough stone was found near San Diego, Cal., weighing over 150 lb., and was bought from the prospector for the sum of \$100. Owing to the fact that the crystal is much like glass, transparent,



Valued at \$10,000

much difficulty was experienced to obtain the photograph from which the illustration was made.

PIGEONS AS AERIAL PHOTOGRAPHERS

By the invention of a tiny camera which can be attached to the body of a pigeon and carried to a considerable

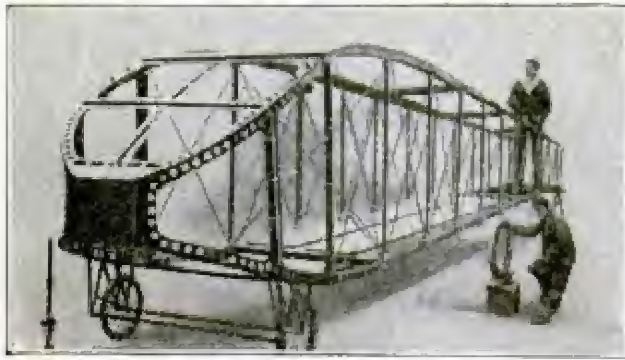


Pigeon with Double Camera

height from the ground, it has become possible to use these birds as military spies. The camera is automatic in action and takes a photograph at regular intervals. The apparatus is made in two forms, one form containing two cameras, and the other only one. The camera attached to a pigeon, as shown in the illustrations, is of the double type.

Such an apparatus might be of the greatest value in war-time, and Germany, recognizing this, is carrying on a number of experiments before military officers. The pigeon-photographers are carried in a portable loft which also contains a dark room in which the photographs are developed.

Of the permits issued in the United States for buildings in 1907, approximately 61 per cent were constructed of wood, and 39 per cent of fire-resisting material.

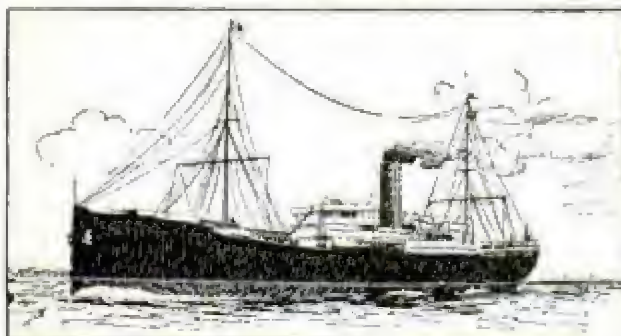


GIRDER-LIKE FRAME OF A PRINCE'S AEROPLANE

The aeroplane being built by Prince Bolotof is of such weight that it must attain a speed of nearly 80 miles an hour before it will fly, but the aviator is undaunted and hopes to fly across the English channel when the machine is completed. The illustration shows the heavy, girder-like skeleton of the flying-machine. The great motor that is calculated to develop 100-hp. weighs 675 lb. The aeroplane will weigh 2,700 lb., nearly 2,000 lb. more than the Wright machine.

SHIP HAS BOTH RECIPROCATING ENGINES AND TURBINE

The steamer "Otaki," built by a Scotch shipbuilding company for the New Zealand Shipping Company, is the first merchant vessel fitted with the combination of reciprocating and turbine machinery, the only previous case being the torpedo destroyer "Velox." In the case of the destroyer the reciprocating engines were fitted at the forward end of the turbines, and were connected when low speed was desired, but in the case of the "Otaki" a turbine with a separate screw was added to the usual reciprocating equipment. The



"Otaki"—Speed 17 1-2 Miles

steam, after having done its work in the reciprocating engines, is passed through the turbine instead of entering the condenser directly.

The advantage of this arrangement was shown in trial tests in which the "Orari," a sister ship, took part. The speed of the "Otaki" was 17½ miles an hour, while that of the "Orari" was only 16 miles an hour, notwithstanding that the boiler installation is exactly the same.

WORKING ON THE EDGE OF THINGS

This great steel viaduct on the Pacific extension of the Chicago, Milwaukee, & St. Paul railroad, consists of heavy plate-steel girder spans on steel



Viaduct 150 Ft. High

towers. It crosses a valley 1,600 ft. wide, near Ritzville, Washington, and the track is 150 ft. high in many places. A powerful derrick car was used for hoisting instead of the ordinary traveler.

MACHINE FOR LOCATING UNDERGROUND WATERS

A machine which is at least a great improvement over the divining rod, and which the French scientific papers claim gives promise of great possibilities, is being experimented with in and around Paris, in the search for underground water.

In order to utilize the machine a hole about 10 ft. deep is dug in the



Detecting Presence of Water

earth and a receptacle filled with water placed at the bottom. The base of the instrument is covered with earth, so that no outside sound can enter, and the tube at the top is placed to the ears. If subterranean water is running or lapping underneath, a sound is heard like the wind in a forest. In experimenting over places where underground water was known to be running at a depth of 200 ft., its presence was made known through the medium of the instrument by a muffled sound.

ROPE FIRE ESCAPES FOR ILLINOIS HOTELS

The Hotel-keepers' Association of Illinois, at a recent meeting in Springfield, voted to install rope fire escapes in every room of their hotels. This, of course, does not apply to the great metropolitan hotels in Chicago, but to the smaller hotels in the cities and towns throughout the state. The question of such protection has been agitated for some time by the Illinois Commercial Men's association, because of a couple of fatal hotel fires in which traveling men lost their lives. The action is commendable because voluntary.

DOG-KENNEL ATTACHMENT FOR AUTOMOBILES

The dog, trotting contentedly along between, or just back, of the rear wheels of a carriage, is one of the pleasant remembrances of the time when the horse was supreme, but horse and dog were both rudely disturbed by the advent of the automobile. Automobiles run too fast for a dog to trot along beside, and as there is not room within the automobile for anything larger than a lap-dog the coach dog had to go.

One English automobile firm, however, is now manufacturing an automobile body that opens at the back, disclosing a roomy kennel for dogs, but it is quite probable that, although better than nothing at all, this arrangement will not be completely satisfactory to either dog or master. Dogs and horses seem to have a close relationship, but the dog will bark in vain if it tries to arouse any response from the mechanical heart of the automobile other than aggravating whiffs of gasoline fumes that would cause any dog to protest.



Automobile with a Dog Kennel

MONUMENT TWISTED BY EARTHQUAKE

The damage wrought in San Francisco by the great earthquake was so

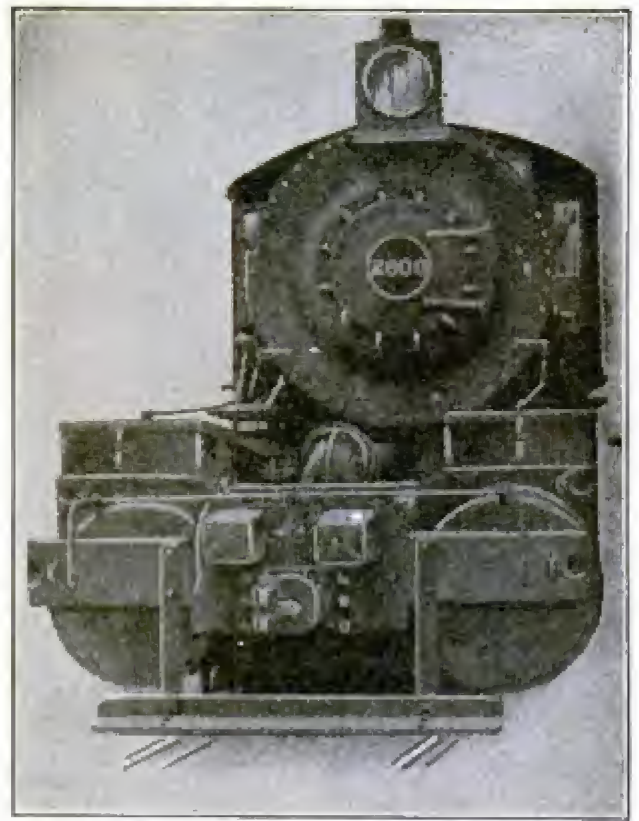


great within the business and resident sections that, until some-time later, very little attention was paid to the ruin in the little "Cities of the Dead" within San Francisco and the stricken area of California. Damage that, in the aggregate, reached a million dollars, was accomplished by the quake in the Californian cemeteries, nearly all of which has been repaired since, but the monument shown in this illustration still stands just as it was twisted by the earth's

tremor. The height of the monument is 15 ft.

LOCOMOTIVES GROWING LARGER

Ten years ago a 50-ton locomotive was considered a very respectable machine; now 200-ton machines are no



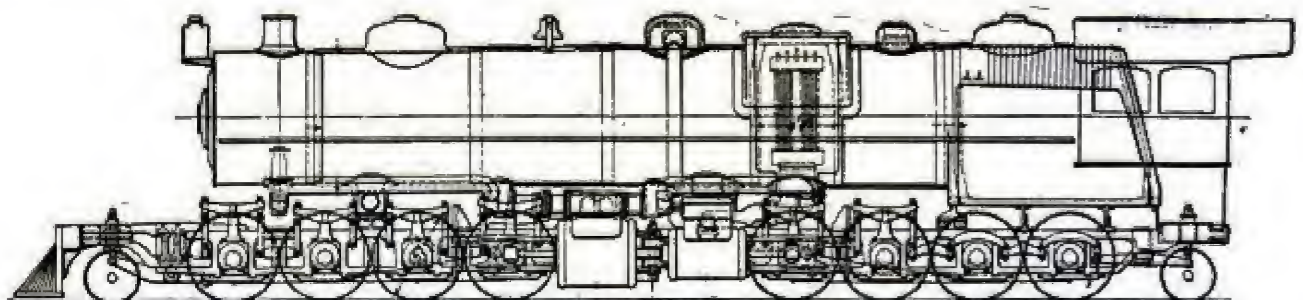
Front End While Rounding Curve

longer remarkable for their size, and even larger are under construction. The type of locomotive shown in the illustrations is known as articulated. There are already in use in this country more than 100 locomotives of this type, the largest of which does the work of three ordinary-sized locomotives.

These engines are so long that special provision has to be made to allow for the swing of the front end when taking sharp curves.

COST OF REPRODUCING THE GREAT PYRAMID

At a recent meeting of an engineering society in Detroit, a paper was read which gave the estimated cost of reproducing the Pyramid of Cheops, in that city. The sole purpose of the



200-Ton Articulated Freight Locomotive

paper was to interest the imagination and to show what the advance of the world in the mechanical has made possible.

It was assumed that the material should be equally as good as that of the original, and that all the chambers and passages should be reproduced. The length of the sides of the pyramid are at present 746 ft., the height 454 ft., and the area of the base $12\frac{3}{4}$ acres. To build it there would be required: 3,313,000 cu. yd. of coarse limestone as backing stone, 140,000,000 cu. yd. of fine limestone as facing stone, 2,000 cu. yd. of granite as facing stone, and 2,000 cu. yd. of polished facing granite. The total cost of the above would be at least \$36,000,000, and the labor required would be 24,000,000 days' work, which is equivalent to the work of 40,000 men for a period of two

years. Assuming that the labor required would cost no more than an average of \$1.50 per day for each workman, this item would reach a total for the two years of \$36,000,000, which would make the total for material and labor \$72,000,000. To this figure must be added at least \$3,000,000 for transportation and smaller items, and, if built in Detroit, or in most places, the cost of a suitable foundation would also have to be considered. The Pyramid of Cheops stands on a foundation of solid rock 120 ft. deep, and if a foundation this deep were built, an additional 2,600,000 cu. yd. of material would have to be used, bringing the total cost of the reproduction up to the \$100,000,000 mark.

The Pyramid of Cheops consumed the labor of 100,000 men for 30 years, which is about 900,000,000 days' work.

FOREIGN TRICAR

Many a visitor to the little town of Sutton, Surrey (England), during the past summer has had his attention attracted by this tricar, or what the inventor has chosen to call a "Charimo" car, meaning motor chariot.

The car was built entirely of odds and ends picked up around a motor repair shop, and has been in use some 18 months. Although its size is somewhat small, it is able to climb a hill.

Channel steel is used in the construction of the car's frame, and the body is made from Venesta wood. This wood the inventor speaks very highly of and recommends it for all light work in a car where such material is required. All of the seats are upholstered in red leather. Under the driver's seat is ample room

for a tool box, while just behind it is space enough for a luggage rack.

In the center of the car is located the engine, which is water cooled. The radiator is under the front part of the car and is entirely hidden from view.

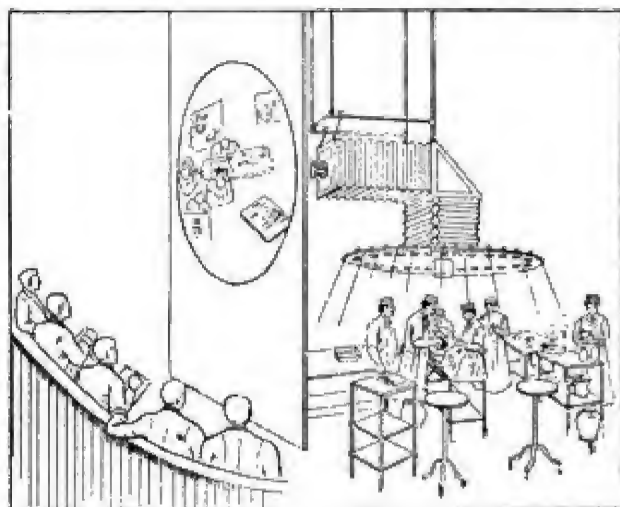


The Front End Is a Door

The gasoline and oil tank is directly under the seat of the driver. It has the usual steering gear, and hand-applied brakes controlling both front wheels. It is the intention of the inventor later on to manufacture such a car for the trade.

PROJECTOSCOPE THROWS OPERATIONS ON SCREEN

As a view of all the intricate details of a surgical operation can be obtained only from a position just above the field



Courtesy Moving Picture World

Watching an Operation

of operation itself, the provisions for demonstrating operations to medical students in a clinic are woefully inadequate. This position is occupied by the surgeon and his immediate assistants, and the student can see very little unless he be one of the few allowed to crowd about the table, where he is an inconvenience to those who are working.

To remedy this fault a projectoscope has been designed which will throw a view of the operation from directly above it, onto a plate-glass screen forming a partition between the operating room and the space reserved for seating the students. This is accomplished by employing a large lens and a surface mirror, which are fastened to a fixture about $4\frac{1}{2}$ ft. above the patient. Around the mirror is a glass shield 5 ft. in diameter, the outer edge of which is studded with lights arranged to provide a uniform, brilliant illumination without any shadows.

As is shown in the illustration, the

vertical light rays from the operating field are transmitted, without refraction, by a prism into an enlarging camera, which is horizontally suspended, and focused on the vertical screen.

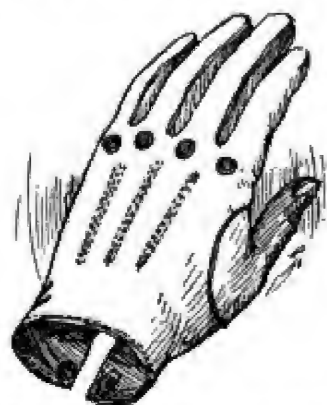
Moving pictures of an operation can be secured by attaching a moving-picture machine to the apparatus. By this means an operation can be reproduced again and again for teaching purposes in medical colleges, or it can be thus reproduced in a physician's office, where he can study it at leisure, slowly familiarizing himself with every detail.

BLUE RAYS STOP TOOTHACHE

The use of light as an anesthetic and a destroyer of germs attracted great interest at the annual clinic of the Marquette University dental department alumni, held recently in Milwaukee. The color of the light must be blue, and the instrument by which sufficient is created to effect the desired result is a brass cone reflector and an incandescent light of 500 cp. The heat develops and the blue screen does the work.

LEAD-WEIGHTED GLOVES FOR GOLFERS

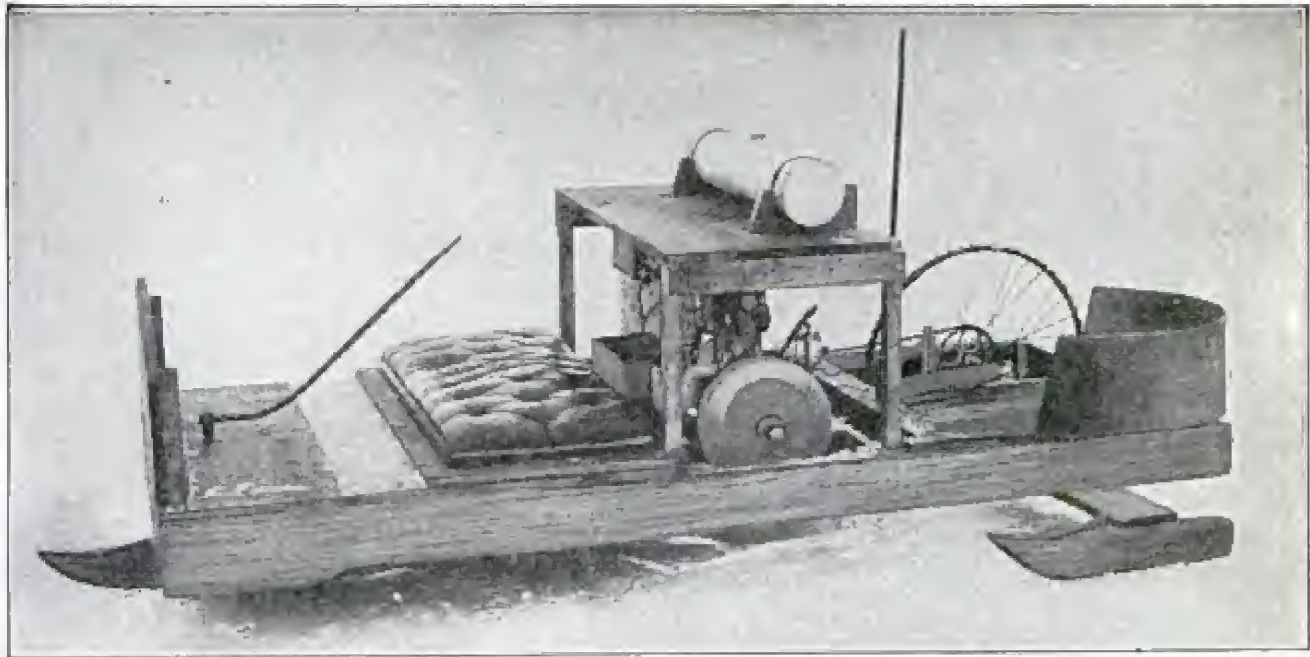
A German inventor has designed a glove for golfers, the fingers of which are provided with little lead weights at the base. These weights rest just over the third knuckles of the fingers and



thumb, and it is claimed that this additional weight on the hands gives an impelling force to golf clubs which cannot be gained by making them heavier.

It is estimated that the cost of the electrical equipment on the vessels of the U. S. "Dreadnought" type will be close to \$600,000 each.

MOTOR ICEBOAT RUNS 70 MILES AN HOUR



Speed of the Boat Is Controlled by the Upright Lever

The motor iceboat affords the finest of all winter sports. It travels as fast as a toboggan, and there is no walking back. Any one who has a small power launch can construct and equip a motor iceboat at trifling cost and with little loss of time. The boat in the illustration was built and run the past winter at Marine City, Mich., by John Milot and John Beebe. A glance at the picture tells how it is constructed. The frame is 8 ft. long, 3 ft. wide, of 2 by 6-in. stuff. The flooring is 1-in. pine; the engine is a 3-hp. taken from their motor boat. The driving wheel is an old metal-rim bicycle wheel, with the

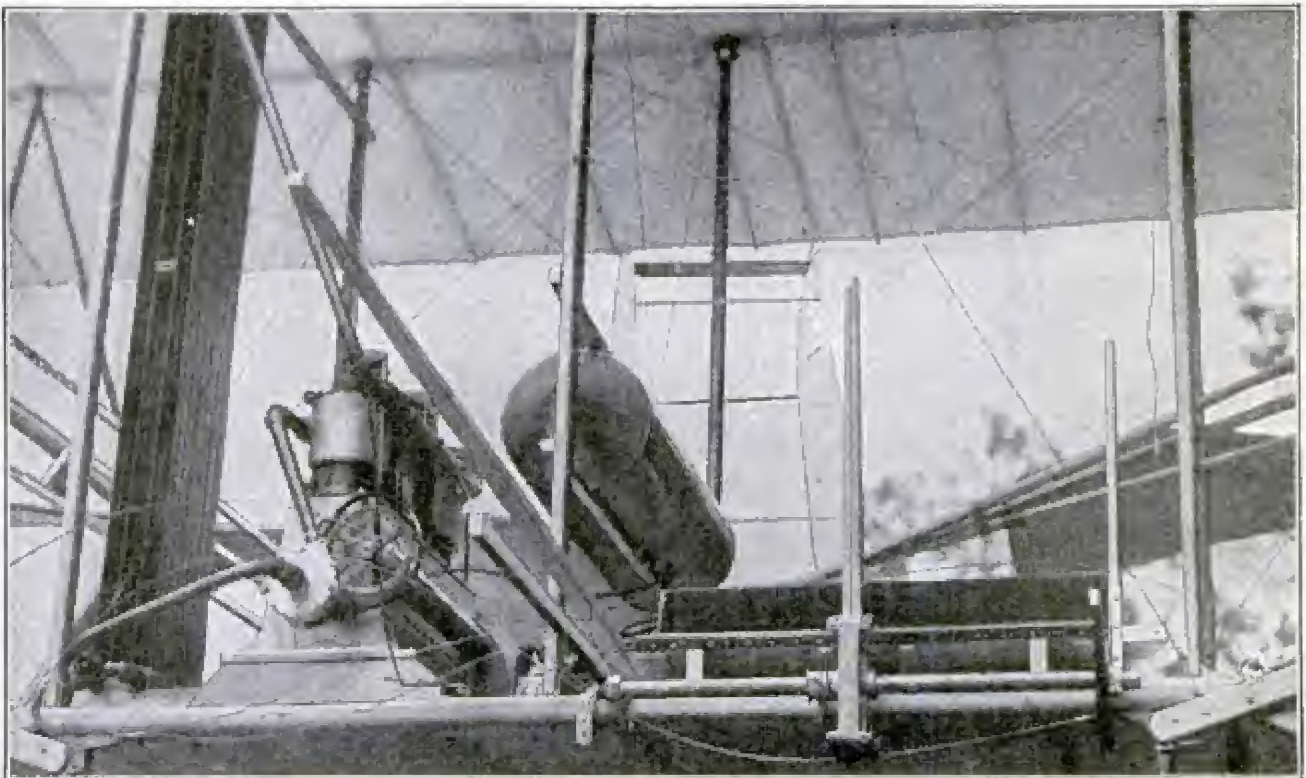
rim chipped to make teeth. This wheel is 28 in. in diameter, connected to the engine with a sprocket chain. The driver is carried in a rocking frame, which can be raised to lift the wheel from the ice, or depressed to make the teeth bite into the ice as desired. This is accomplished by moving the upright rod shown. The rear runners are 5 ft. apart. Steering is by means of the steering rod shown and the single front runner. In case of accident this steering rod would be dangerous; a horizontal steering wheel can easily be substituted and would be much better. The boat attained frequently a speed of 70



Orville Wright in His Airship—The two screw propellers, one on either side of the rear rudder, can be seen. The front horizontal rudder is used in steering the ship up or down. This rudder presents a curved surface to the air when ship is ascending or descending.

g and h. When the rope is pulled toward the left the right end is tightened and slack is paid out at the left end. This pulls down the corner d and raises e. The corner a is raised by the post which connects a and e. The rope 4, passing from a to b through pulleys at m and n, is thus drawn toward a and pulls down the corner b. Thus a is

raised and b is lowered. At the same time the rope 4 turns the rear rudder to the left as shown by the dotted lines, thus forcing the side R against the wind. Of course if the left side of the machine starts to fall the rope 3 is pulled to the right and all the movements take place in the opposite direction.

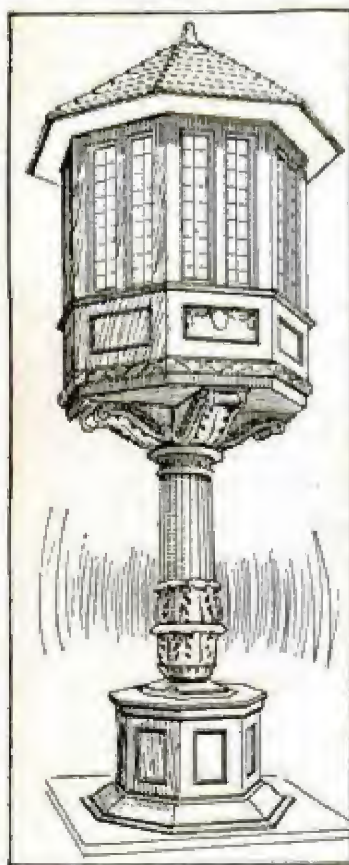


The Seat and Motor of the Wright Airship—This picture shows the levers with which the operator controls the machine. With one lever he controls the warping of the planes and the rear rudder. With the other he controls the front horizontal rudder.

Rope 3, which in the earlier machine or glider was operated by means of a "cradle," is in later machines connected to a lever. By means of this lever the operator controls the warping of the planes. The movements described are possible because the joints are all universal, permitting movements in any direction. When fixed in any position by setting the lever the planes are held perfectly rigid by the two ropes together with other ropes not shown in the figure.

TOWER SWITCHING SYSTEM FOR STREET RAILWAY

An electrically operated street railway switch system, which is expected to make collisions impossible, has been installed at the plaza in front of the Union station and at three other switching points in Washington, D. C.



The system is interlocking, and operators in towers manipulate the electric switchboards which throw open or close the switches of the system. The signaling to cars, which is another new feature, is done by means of electric lights set below the level of the street at the entrance of the several switches.

These signal lights are located in excavations similar in shape to a manhole. These holes are covered by an iron grating, and each contains a red and a green light, enclosed in waterproof casings.

The portion of the system which makes collisions almost impossible is a releasing device, located about 200 ft. from each switch. When the switch



Water falling from a great height, or by other means given a great pressure, will issue from a small nozzle, say, about 1-5 of an inch in diameter, with such force that a man cannot cut it with a sword; in some cases the impact will even break the weapon. The illustration shows a stream of water in France that will stop a sword cut, as surely as steel armor.

is set by the electrical apparatus controlled by the operator in the tower it is automatically locked. The lever in the tower which controls this particular switch is simultaneously locked, and it cannot be moved until the car has cleared the switch and passed over a releasing contact 200 ft. from that point.

The lower portion of the towers is constructed of cast iron, and the upper part, which is 8-sided, of ornamental copper.

THE LETTER TELEGRAMS OF FRANCE

A system of letter telegrams has been inaugurated in France by which from certain offices in France and Corsica letter telegrams, paid in advance, can be transmitted by wire during the night at the rate of 1 centime, which is 1/5 of an American cent, a word. No mes-

sages are forwarded at a charge of less than 10 cents. In the morning the messages or letters thus forwarded are sent out as mail matter by the earliest delivery.

Railroads in France are not as numerous as they are in the older sections of the United States, and mail sent from the southeastern section of France does not reach Paris until 20 hours later. The letter telegram is an experi-

ment, and its continuation will depend upon the extent the public avails itself of it. Considering the low rate provided, and the immense convenience to business interests in the opportunity of sending out lengthy messages at the close of the business day with the knowledge that they will be received the next morning at distant points, there seems to be every indication that the public will use the privilege to a great extent.

LARGEST WATERWHEEL IN AMERICA



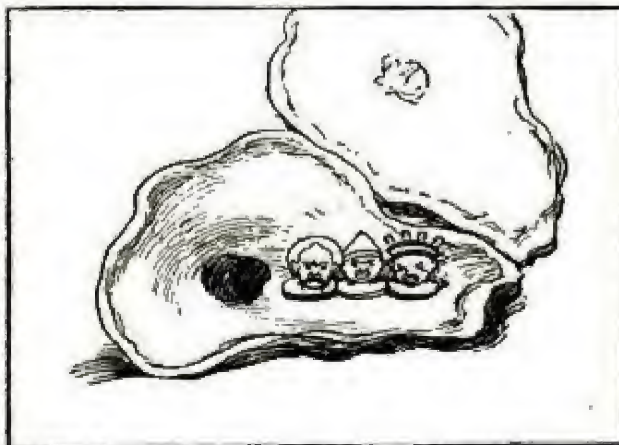
The huge waterwheel shown in this illustration is claimed to be the largest in America, if not in the entire world. It has a diameter of 60 ft., with buckets 22 ft. long and 6 ft. deep. Troy, N. Y., where it was erected in 1838 to drive the machinery of Henry Burden's iron shop, is so proud of the great wheel that an attempt to demolish it a short time ago was frustrated by popular expression. When running at a speed of two revolutions a minute the wheel could develop from 500 to 600 hp.



The reader will have no hesitation in recognizing in the above view a summer resort. But it will hardly occur to him that this pleasant park is located on the roof of one of America's highest hotels. Fountains, flowers, growing grass and shrubs and plants of many hues are here to please the eye, while cozy nooks and rustic bowers shelter easy chairs and tables for guests. The picture, for which we are indebted to the Hotel World, was taken during the summer months.

PEARLS FROM TINY CHINESE IMAGES

Compelling oysters to produce pearls by placing a foreign substance, such as small pebbles, in their shells has become



Courtesy N. Y. Herald

A Chinese Idea

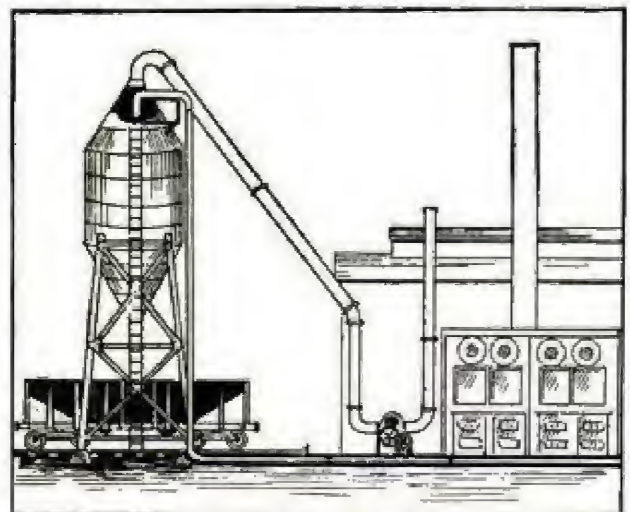
an extensive industry, in which the Japanese have especially excelled, but the Chinese can claim distinction in the originality of one of the substances often used by them. This is none other than tiny leaden gods or images, and when the oyster has formed the pearl around this nucleus, a process which extends over a period of four years, the shell is opened and the prize removed.

Usually the pearl is in the form of the image.

SUCTION CONVEYER FOR HANDLING ASHES

The accompanying drawing shows a complete suction conveyer for the handling of ashes. It consists of a conveyer pipe, of iron or steel, a separator, exhaustor, and water jet. The conveyer pipe is made in three sizes, having a capacity of 200 lb., 300 lb., and 500 lb. per minute.

The separator, which is really an ex-



Suction Ash Conveyer

pansion chamber, also serves as a storage tank. It is always placed at the end of the conveyer run, where it catches the ashes and holds them until they are drawn by gravity through an under-cut gate into receiving cars or barges. The exhaustor consists of a rotating propeller surrounded by a suitable casing, with an intake air opening

at the center and a discharge opening at the circumference. Just before entering the separator the ashes pass through a water jet, located in the conveyer pipe. This jet eliminates all dust and cools the ashes.

The intakes of the conveyer are placed in front of the ash pit, the ashes being hoed or shoveled in.



The above illustrations depict the busy condition of the harbor at Galveston, Texas. In the photograph of the great fleet of merchant vessels about 35 foreign ships are shown. The other illustration shows 19,000 bales of "square" cotton on the wharf, and a ship that can carry 15,000 bales.

THE AMERICAN FLEET OF BATTLESHIPS

Commenting on the successful cruise of the American battleship fleet, the *Shipping World*, of London, says:

* * * But this, at all events, has been established, namely, that ship for ship the circumnavigating battleships which belong to the United States navy are, perhaps, unexcelled as a whole by an equal number of fighting ships of any of the fleets of the world, with the possible exception of those of our own country. We state that proposition and make that exception upon the authority of Sir William White, made and published some time ago; and this fact establishes the second proposition, that the "King Edward" class, and other vessels, which do not come under the designation of "Dreadnoughts," constitute magnificent ships, well calculated to give a good account of themselves in any possible emergency that might arise. It seems but yesterday since one of our distinguished naval architects,

no longer with us, prepared some designs for the nucleus of an American navy. Now that navy takes the second position among the fleets of the world. It is true that the distance between the United States and the United Kingdom as naval powers is represented by 42.3 per cent and 13.7 per cent respectively; but the needs in the two cases are widely different. Our very life and existence as an independent people depend upon our being able to beat off by the power of our navy any probable or possible combination of naval forces against us, while with the United States it is not so. Even assuming the landing of forces upon the Pacific coast, and further conceding the possibility of temporary victories, a nation fast advancing towards a hundred millions of people—bright, inventive, capable, strenuous people—must inevitably, in the long run, entirely crush any such invasion.

—♦♦♦—
Austria has built two 60-ft. gasoline motor gunboats for river work.



With the new constitution in Turkey has come a desire for progress in the mechanical as well as other branches of improvement. This illustration depicts the excitement in the streets of Salonica, the second largest city in Turkey, when the first steam roller ever seen by the majority of its inhabitants was first used. Everywhere the steam roller goes a crowd of excited Turks precede and follow, waving flags, clapping, shouting and having as much fun as an American boy watching a circus parade.



WOMAN EXPERTS TEACH ECONOMY IN USING GAS

They Go from House to House and Cook Meals to Show Housewives How to Save Unnecessary Waste in Gas—Also Explain the Mystery of the Gas Meter

Realizing that very few of the thousands of housewives who use gas for cooking and lighting purposes know how to regulate the gas jets or the burners of a gas range so as to get the maximum amount of illumination or heat with the minimum amount of expenditure, the gas companies of the larger cities of the country have inaugurated a new and welcome department which has as its purpose the remedying of this general lack of knowledge. Not only does the new department strive to accomplish this missionary work, which makes more economical housekeeping possible, but through its aid every woman can easily familiarize herself with the most bewildering of mechanisms—the gas meter.

The workers in this new department are women, selected with the greatest care, as their personality counts almost as much as their ability to instruct. The task set for them is not always easy, as this short interview with one of the woman teachers attests:

"It is always possible to make a woman feel humiliated when you call to show her how to do what she thinks she knows how to do herself. Possibly she has complained to the gas company

that the stove will not work properly. The reason may be that she does not know how to use it, but it would not do to tell her so. So we proceed to find out the reason and do it so adroitly that she still believes the fault was with the range and not with her, but at the same time has learned enough to make certain that there will be no future complaint."

Where the idea of this new department originated is not known. Chicago has just claimed the credit for it, but the gas companies of Philadelphia,



How to Light the Burner



Explaining the Gas Meter

New York and other cities also have such departments, and advance counter claims. In Philadelphia the staff of women go from door to door, or make special visits if called. If the housewife is out, and the home is in charge of a younger member of the family, the expert, if the outlook seems propitious, will remove her hat and coat, don an apron and prepare some dish with the intention of showing how the gas range can be used for preparations it was scarcely thought possible gas could be persuaded to cook. Therefore, do not be surprised, if you are a city dweller, should you receive a call from a trim, business-like little woman who asks:

"Are you having any trouble with your gas range? Yes? Well, then, let me come in and see what I can do to remedy it."



"It Is Easy to Economize"

"Yes, I understand. You have just bought the range and cannot make the oven heat properly. You see, you are not familiar with the range and have been trying to use it in accordance with coal range ideas. Now, we will start at the beginning and learn. First, so many women make the mistake of trying to light the gas at the same time they turn it on. A second or two should be allowed to elapse before applying the match, so that the gas can expel the air. This makes the burners work better and saves gas. Please remember that it is easy to economize in gas by using care."



A Small Flame Is Usually Sufficient

"For instance, notice this little extra burner back here. It is a simmering burner, but it is often neglected because many women forget that a large amount of gas can be saved by its use. When a saucepan no longer needs the entire heat of a burner it is only necessary to transfer it to the simmering burner to leave the larger burner free for something else, and to save gas."

So the lesson continues, covering every detail that might be of benefit. One housewife, in describing her experience with one of the woman experts, said:

"It was much nicer than having a man sent to the house by the gas company, as I was afraid would be the case if I complained. After working with me over the stove she went into the cellar and fully explained the meaning



This train was snowed up for three weeks in the highlands of Scotland. The advance was slow, as gangs of men had to shovel the snow from the tracks and the train crept along behind them a few feet at a time.

of the mysterious little figures that register the amount of gas burned. I had never understood them, and I don't think my husband did, although he wouldn't admit it. We knew, of course, when the bills came in that the gas had been passing through the meter at a furious rate, but the figures themselves had never served as a warning, for we knew nothing of their meaning.

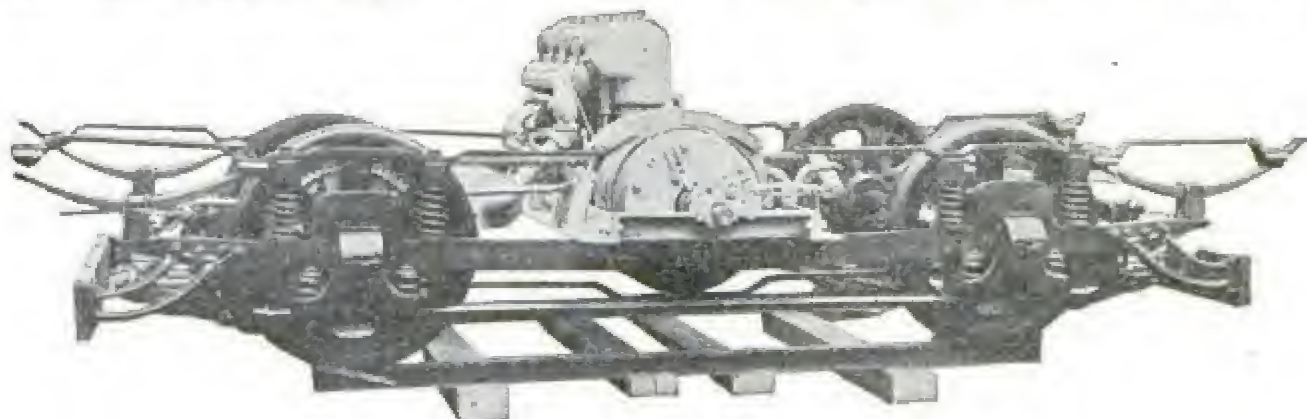
"There were so many things explained by her about the gas range that I cannot now understand how I got along without the little lesson. It is possible to forget a good many things, even after attending a cooking school, and the new gas ranges are usually fitted with some improvement that needs a demonstration to be fully understood."

Crocodile flesh is considered a great delicacy in upper Egypt.

GAS ENGINE STREET CAR MOTOR

The illustrations show a recent construction in which the gas engine is applied to the operation of a street car. In this construction former devices have been greatly simplified. Several cars equipped in the manner illustrated are now running with a degree of success which is said to be fairly promising. The motor consists of a 4-cylinder 4-cycle gas engine, which at 500 r. p. m. affords about 50 hp. Power is transmitted to the four driving wheels by means of gears, clutches and sprocket chains, controlled from each end of the car, which operates in either direction. The engine has 7-in. cylinders with 7-in. stroke; water cooled.

The engine is designed to work on



Operating Small Street Cars with Gasoline Engine

single-truck street cars of about 20-ft. bodies, seating 32 passengers and capable of 20 miles an hour over level track with a gasoline consumption of one gallon to 6 miles.

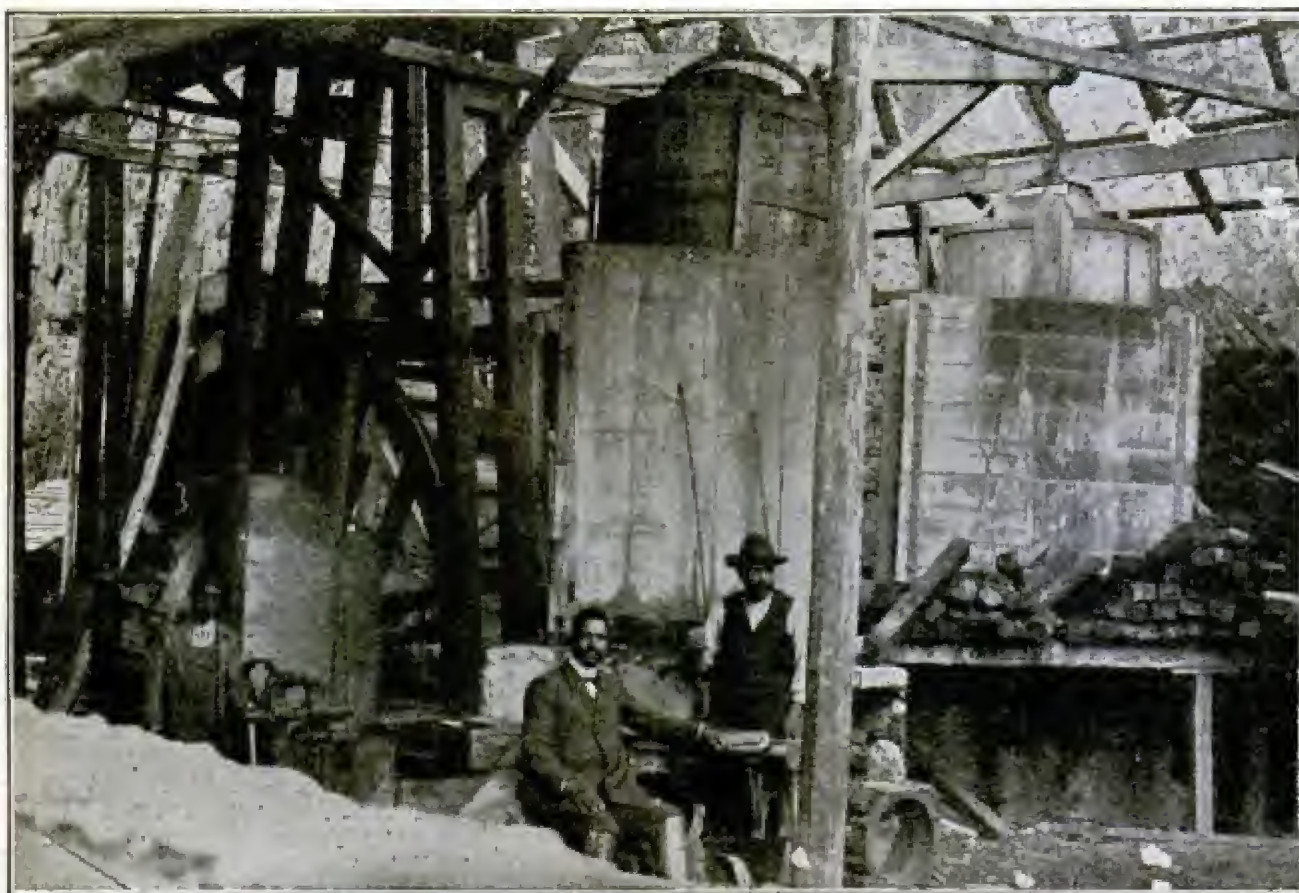
MEXICAN AIR COMPRESSOR

The picture shows a home-made air compressor in use until a few months ago at the Neptune tunnel in the El Chico district near Pachuca, Mexico. It consisted of two wooden boxes as pistons working in wooden tanks with

UNITED STATES PLANS BIGGEST BATTLESHIP

Plans have been outlined by the bureau of construction of the United States navy for a huge battleship of 25,000 tons, designed to carry eight 14-in. guns. The speed of the new design of battleship is figured as 24½ miles an hour.

Such a battleship would far outstrip the great "Dreadnoughts" of other nations, the largest of which is of but lit-



Ingenious Air Compressor Used in a Mexican Mine

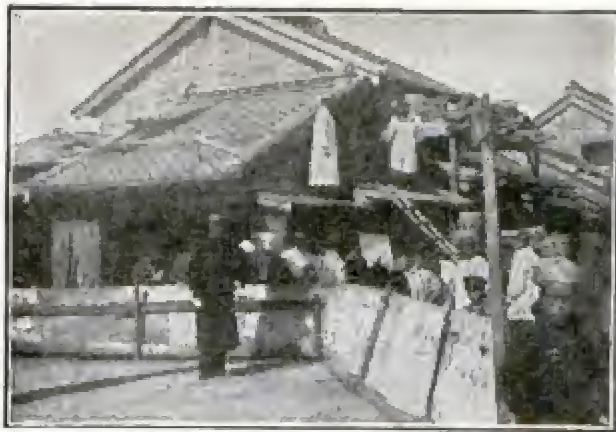
suitable valve arrangements. The compressor was used to furnish air for the face of the tunnel then in about 1,000 meters. It was driven by an overshot water wheel also of wood to which the plungers were attached by a sort of walking beam so as to alternately rise and fall. The device was quite satisfactory. A new installation of modern machinery has replaced the old compressor, which still stands at the portal in striking contrast to the compact and efficient substitute.—Contributed by Kirby Thomas, American Club, Mexico City, Mex.

tle more than 20,000 tons. The largest guns used on any battleship at the present time are of 12-in. caliber.

RATS, DESTRUCTION, PLAGUE AND CATS

The head of this short article has many joints, but so has the article itself, which has to do with the destruction caused by rats, the bubonic plague, which is spread by rats, and the extermination of rats by their natural enemy.

A deputation from the British In-



A Rat "Round Up"

corporated Society for the Destruction of Rats, headed by Sir James Crichton Browne and the Duke of Bedford, is urging the British board of agriculture to appoint a commission to inquire into the subject of the destruction caused to crops by rats. The deputation pointed out the enormous damage done by rats, which amounts, on a moderate computation, to nearly \$75,000,000 annually in Great Britain. This figure was arrived at by allowing only one rat to every acre of land, assuming that each rat does damage to the extent of one-half a cent per day. There are 40,000,000 acres of land in Great Britain.

Sir James Crichton Browne incidentally stated that 2,000,000 people died of plague in India, and that rats were the chief cause of the spread of the infection. Also that in Great Britain and its colonies more than \$1,000,000 is spent each year on rat poisons, which is considered many times more than would be required if the campaign were systematically conducted.

Since the Japanese government decided that the keeping of cats is the best means for the prevention of plague, the officials of Japan have been investigating to discover the number of cats maintained and their relative value. The result of the investigation made by the police department of Osaka, a city of more than a million people, showed that its cats numbered 54,389, belonging to 48,222 families.

INGENIOUS DEVICE FOR AIMING BIG GUNS

A new aiming device for big guns that makes possible a continuous aim has been installed in two U. S. battleships and more will be placed in position as soon as possible. The movement of the guns in vertical plane on their trunnions and the rotation of the turrets are effected by means of electric motors equipped with a new hydraulic transmission, which permits a very delicate control of the speed, enabling the gunners to keep the guns trained in spite of the rolling of the ship.

TRAIN WRECKED BY FLOOD

This illustration shows a fair example of the troubles the western railroads have for some time been contending with in the way of floods. The wreck occurred on the Missouri Pacific railroad near Auburn, Neb. The track was washed out by the overflowing of the Nunaha river.



No Trouble from Dust on This Line



DEATH VALLEY'S SALT SUMP

By R. E. Rhinehart, Prescott, Ariz.

Easily the most prominent and distinctive feature of Death Valley is the Salt Sump. This glaring white marsh covering the larger portion of the valley floor is responsible for much of the region's evil reputation and particularly some of its most notorious characteristics. It goes a long way toward singling Death Valley out from the row of desert valleys in the vicinity.

This salt sump is the natural cistern for a large desert area made up chiefly by the Ralston desert and Amargossa desert. Death Valley itself is the dry bed of the lowest of a cluster of lakes that once covered this portion of the desert. Consequently the drainage from these higher lake beds and the wash from the Funeral and Panamint mountain ranges have formed the Death Valley marsh.

Death Valley, not including its north arm, known both as Lost Valley and Mesquite Valley, is about 70 miles long. It varies in width from 10 to 20 miles from foothills to foothills. The sump covers perhaps one-half of this area. It extends almost the length of the valley. Its greatest width is close to eight miles. Near the middle of its length it is barely two miles across.

Around the rim of the marsh the field is extremely hard and rough. It is made up at this portion of dirt and salt dried into great jagged chunks, light brown in color, that are known in the locality as "pinnacles." These pinnacles are difficult to break even with a heavy sledge hammer.

The center of the sump is soft. It is composed of a livid muck, in many

places covered with yellowish brackish water.

On account of this soft center passage over the marsh is extremely dangerous and can be made in but few places. Across the north half are two trails for pedestrians, one leading from Furnace Creek ranch to Blackwater, in the Panamint mountains. Several footpaths traverse it at the lower end of the valley in the neighborhood of Bennett's Wells. Wagons can cross at but one place, about midway, where a road was constructed during the days the borax industry worked the north end of the marsh.

Death Valley's great heat reaches a maximum on the sump. William Mellen, of Boston, and E. Brockington, a Panamint prospector, reported that in crossing the marsh in June, 1907, they caught 156 deg. with a black thermometer. The intense heat on the marsh has its effect throughout the valley. While 122 deg. was the highest point attained in 1891, when the government maintained a meteorological station at Furnace Creek ranch, 130 deg. has often been reached in other years during July and August. A thermometer hanging on the north side of the adobe house at the ranch is said to have registered 137 deg. one stifling day in 1883.

The marsh unquestionably is responsible for the valley's exceptional aridity. The dry winds from the Mojave and Amargossa valleys enter Death Valley at the south end and blow north over the sizzling surface of the sump. With every drop of moisture roasted out they

reach the upper end, dry as a furnace blast. The 1891 Weather Bureau party made record of one day at Furnace Creek ranch when the humidity of the atmosphere dropped to 7 per cent. North of the ranch on the marsh it is asserted the air at times in August has zero humidity.

No recorded chemical analysis of the muck of the sump seems to exist, but during the work of a borax company at the north end it was found to be composed largely of salt, soda, and borax. Though soundings have been made of the marsh in a crude way no depth has ever been found. The longest pole vanishes without a hint of the bottom. A weight is said to have carried down 200 ft. of line without a stop.

Viewed near or far, the sump is the striking picturesque landmark of the region. From the summit of Funeral range it glares beneath the evil Death Valley sun as a flood of molten steel.

Standing on a moonlight night in its midst it seems a frozen, choppy sea sprinkled with drifted snow.

LUXURIOUS FITTINGS IN AUTOMOBILES

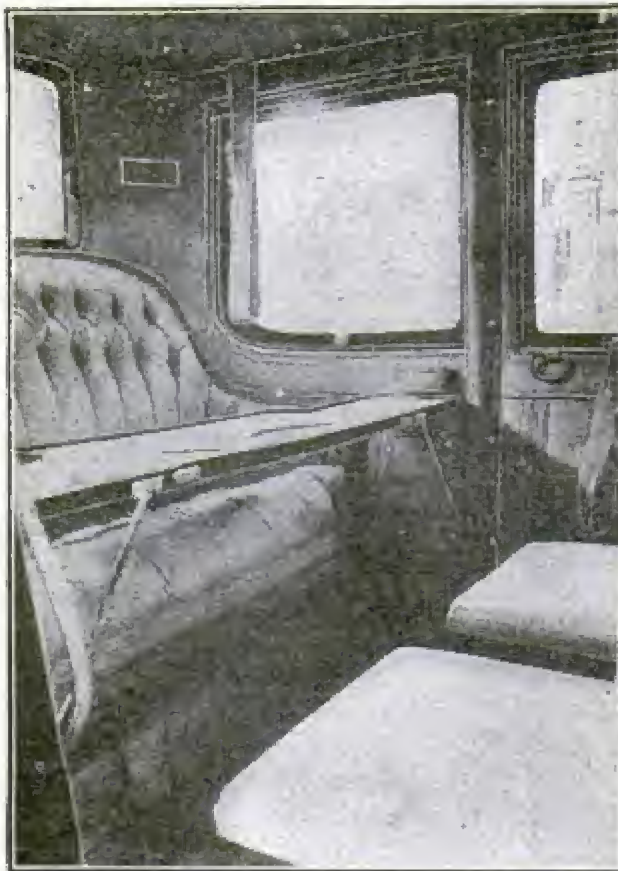
The interiors of the larger automobiles are becoming more ornate and more ingenious day by day, as is shown by the interior views of these two machines, recently on exhibition at the London Automobile show. The interior of one of the cars is fitted with a shelf that can be used as a dressing table, containing receptacles for hand-mirrors and other necessities of the toilet; a writing desk, and seats that can be converted into lounges. To form a lounge, the back of either of the front seats is pressed down until it meets the back seat.

The other illustration shows a luxurious car interior with a card-table



Galveston is the great port of the South for immigrants. The photograph was taken just as a shipload of them were going ashore from a ship of one of the German Trans-Atlantic lines. The government inspectors pin a tag on the breast of every man, woman and child as soon as he has passed the examination.

which can be dropped into position for 4-handed games. Brilliantly illuminated, these cars make night journeying as comfortable as an evening spent at home.



Automobile Equipped with Table for Card Games—Lounge, Writing-Desk and Dressing-Table in an Automobile

SAND SPRINKLERS FOR ASPHALT PAVEMENT

The street cleaning department of Magdeburg, Germany, has made successful experiments with a sand-strewing wagon constructed by a German inventor. The apparatus is worked by the driver and can be adjusted to strew an even layer of sand over a stretch of pavement from 20 to 40 ft. wide. The sand minimizes the danger of slipping when the pavements are extremely wet or frozen.

A LAMP-SHAPED BOMB

The bomb shown in one of these illustrations was exploded on the small



Lamp and Imitations

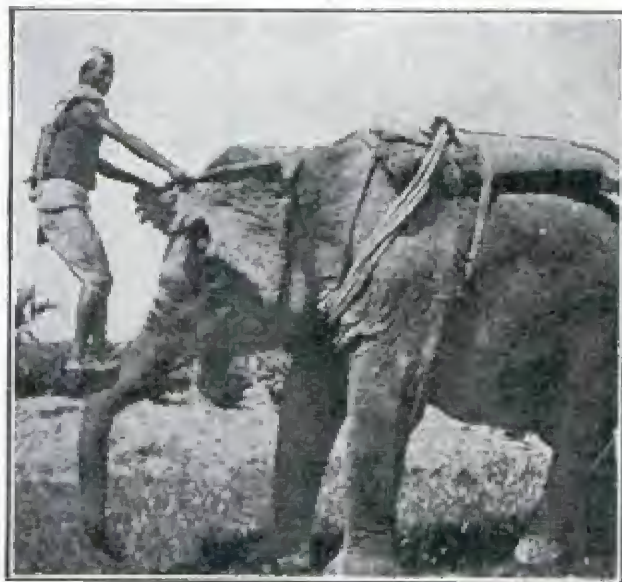
pleasure steamer "Golondrina," injuring three people. It was made in the form of the small gasoline lamps used by Italian marine engineers, and in such manner escaped detection. The first illustration shows a wooden model of the bomb, the second the engineer's lamp in imitation of which the bomb was made, and the third is the cast-iron bomb itself.

RESCUE STATIONS IN COAL FIELDS

The United States geological survey, in an attempt to reduce the number of fatalities in the coal mines, is prepar-

ing to establish rescue stations in the principal coal fields of the country. The new stations will be at, or near, the greatest centers of accidents. Government mining engineers, thoroughly trained in the use of rescue apparatus, will be assigned to the stations for the purpose of teaching the miners and mine bosses the use of the most improved devices, and to go at a moment's notice to the scene of a disaster.

Each station will have men equipped with oxygen helmets, which will enable them to enter a mine regardless of smoke and gas. The engineers of the geological survey who are studying the waste of coal in mining will also have their headquarters at these stations.



The easiest way to mount an elephant, providing the huge animal is willing, and he usually is after sufficient training, is by way of the trunk. The rider stands in front of the elephant and grabs it by the ears. This is the signal for the brute to arch its trunk, and the rider steps upon it and is lifted to the top of the head.



CONCRETE BRIDGES FOR LOS ANGELES

The city of Los Angeles, California, is building or preparing to build a number of large concrete bridges. The illustrations show the progress of a \$60,000-bridge over one of the gullies. The 70-ft. steel reinforcement rods extending out of the cement abutments are shown in one of the illustrations, and another furnishes a view of the general progress of the work, and the steel lattice-work booms being used for

Steel Rods Extending from Abutment—Derricks—These Spouts Carry the Wet Cement



lifting purposes. Wet concrete will be run into position through galvanized iron spouts. These, with a swivel angle in the foreground, are also shown in one of the illustrations.

A CITY OF SNOW-WHITE DOMES

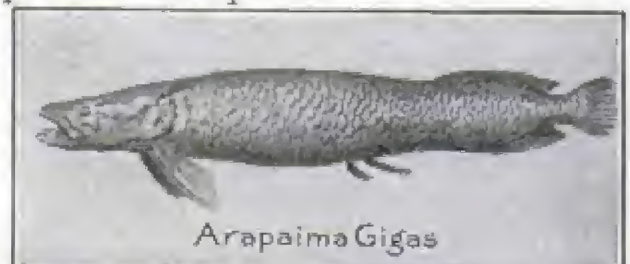
The little city of El-Oued, with its population of 8,000 people, at the extreme south of the Province of Constantine, in Algeria, is unique even for a Mohammedan city, because of the great number of its snow-white domes or cupolas. So extraordinary is the great number of these cupolas that many writers have referred to El-Oued as "The City of a Thousand Cupolas." The homes of the residents of El-Oued are constructed of white plaster, and were it not for the whiteness the domes would be taken at a cursory glance to be a city of coke ovens.

CURIOUS FISH IN FRESH AND SALT WATERS

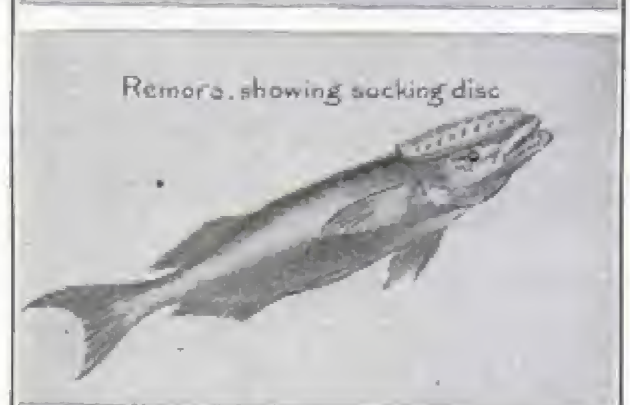
Of all the denizens of air and land there are none more curious and interesting than those that infest salt and fresh waters. The three fish shown in the illustrations are representative. One is the "Arapaima Gigas," the largest fresh water fish known. It thrives in the rivers of Brazil and often attains a length of 15 ft. Another is the

Algerian City as Seen from a Hill-Top Which

"Remora," or sucking-fish. It is found in tropical and warm seas. By means of the adhesive disc on the top of its head it attaches itself to whales and ships and is thus carried about from place to place. It can give any human being pointers on how to beat transportation companies.



Arapaima Gigas



Remora, showing sucking disc



The Archer



Is Known as the "City of the Thousand Cupolas"

Still another curious fish is "The Archer." It can project a jet of water a distance of 5 ft., and uses this gift of nature to knock insects into the water for its daily meals.

AEROPLANE STATIONS ON PARISIAN ROOFS

That property owners in Paris are seriously considering the possibility of aeroplanes descending on their roofs is clearly shown by the action many of them have already taken. One owner of a modern apartment house of seven

stories, situated on one of the main boulevards, has put a clause in all leases to the effect that no tenant can object if in the near future the roof of the building is used as a landing place for airships.

The owner of another house, six stories high, has set apart the roof as a station and garage for aeroplanes, and has invited aviators to use it as a starting and landing place. Several hotel proprietors have offered prizes to the first aviator to descend on their buildings, doubtless hoping to gain much publicity therefrom.



This double-deck car is one of many used on one of the suburban railways of Paris, where they prove of great convenience during rush hours. Smoking is allowed in the upper compartments.

A CURIOUS FRICTION DRIVE

This curious friction drive is used in one of the oil fields near Los Angeles, Cal. The large wooden wheel is about 9 ft. in diameter, and the small iron wheel about 30 in. in diameter.



Large Wheel 9 Ft. in Diameter

The rim of the latter is slightly hollowed out, which is just opposite to the treatment usually given a belt pulley. Old rope is nailed to the rim of the wooden wheel. The powerful lever shown in the illustration forced the small wheel against the rope-tired rim of the wooden wheel.

REINFORCED CONCRETE POWER DAM IN MAINE

A new reinforced concrete dam at Ellsworth, Maine, is the highest power-dam in England, and next to the highest used for any purpose in that section of the country, its only peer being

the dam at Clinton, Mass., used for storage purposes.

The head of the Ellsworth dam is 71 ft. high, the spillway 65 ft. high, and its length over all 450 ft. It is 98 ft. through at the base, and being hollow, admits two passageways at different levels, one of which runs the entire length and the other nearly so. About 16,000 barrels of cement were used in its construction.

The dam feeds two turbine water wheels, one of 1,700 hp., and the other of 850 hp. Provision has been made for the addition of another water wheel of 850 hp. to be installed as soon as required.

POWER OF NEW CENTRIFUGAL PUMP APPLIED DIRECTLY TO WATER

A small boy and a hose are usually close companions in the summer time, and if, in watching this combination at play, you have ever noticed the boy pick up the hose a few feet from its end and whirl it around on a level just above his head you are conscious that the water slowly running from it is whirled out with considerable force, thus creating a vacuum within the hose. It is on this principle that the new centrifugal pump (patented) for irrigation purposes, described in this article, works, the water being raised by the same force that causes a flywheel to burst into pieces when revolved too rapidly.



New Dam at Ellsworth, Maine, 71 Ft. High

The most interesting and revolutionary feature of the new pump is in the fact that the power is applied directly to the water, only about three per cent being lost in journal, speed resistance, and friction. The pump will draw water at a speed of 40 revolutions per minute, and its capacity increases in proportion to the speed of its revolutions.

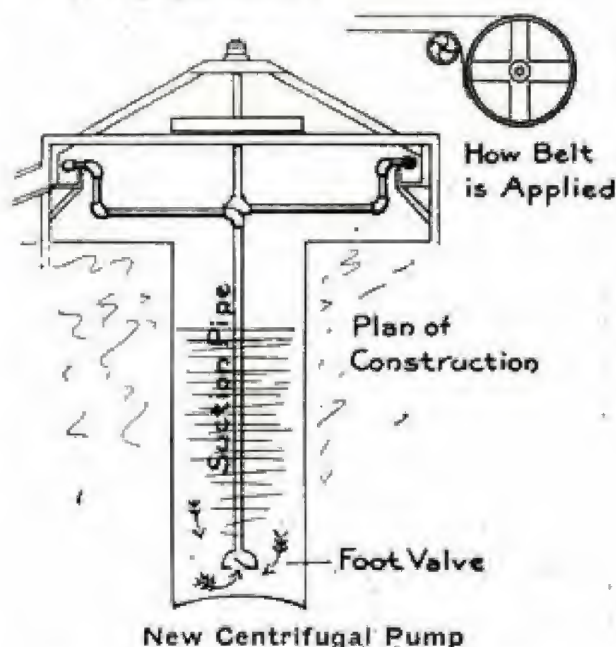
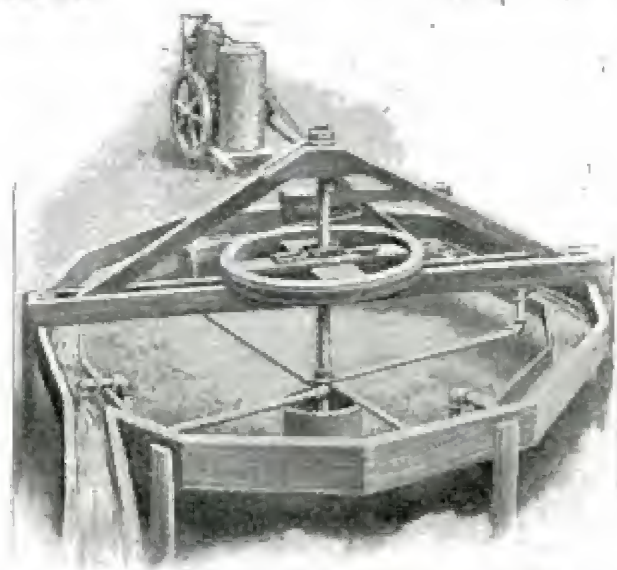
In the mechanical construction of the pump there are no runners, plungers, stuffing boxes, or piston rods; in fact nothing but open pipe. From intake to discharge the open pipe constitutes the pump, connected at the top with the driving shaft which whirls it around. The driving shaft and pump are hung from a truss, power being applied to the shaft by belt connection. Being hung on ball bearings at the top the pump seeks its own equilibrium at all times, and hangs without any guide except this one journal at the top. Primed full of water, it turns as freely and easily as a balance wheel until the speed is reached where the water starts moving outward in suction arm. It can plainly be seen that the power is thus applied directly to the water, as up to the point just before the water commences to whirl the resistance is practically nothing.

It is the whirling motion made by the open pipe that causes the water to move from the center to circumference, thereby creating a vacuum in the horizontal pipe. Atmospheric pressure does the rest as in a siphon, power being applied simply to assist natural conditions. When the water is raised to the top it is discharged through the whirling pipes into a continuous trough or tank. These discharge pipes have the effect, so to speak, of running away from the water they discharge, as does the end of the hose whirled by the boy.

The pumps are made both with a single discharge arm or pipe, and with four discharge pipes. A weight is required with the former as a counterbalance, but the latter is kept in perfect balance at all times by the four arms.

A number of these pumps have been

installed for irrigation purposes in southern states. They raise water about 30 ft.



GREAT RAILROAD BRIDGE PLANNED

Plans have been drawn by the Pennsylvania railroad for a bridge three miles long to connect Port Morris, a suburb of New York, to Queens County, Long Island. In many respects it is one of the most daring and remarkable engineering structures ever proposed. It will span the Hell Gate ship channel with an enormous steel arch 1,000 ft. long, the most novel feature being in the fact that the train floor instead of resting on the crown of the arch is to be hung from it. The crown will be 300 ft. above the water and the floor 140 ft.

The entire bridge, except the piers

for the arch, will be of steel, having an estimated weight of 80,000 tons, or 160,000,000 lb.

CONCRETE RETAINING WALL GUTTER

The lawn of this piece of property in Pasadena, Cal., is raised above the level



Retaining Wall with Gutter

of the sidewalk line, and to protect the terracing from crumbling away has a concrete retaining wall. At the inner edge of the top of the wall is a concrete gutter to catch the water and carry it away.

A BANK IN A DEPOT

An idea as unique as the "all night savings bank" has been carried out by the opening of a bank in the Union station at St. Louis. The bank is known as the Union Station bank, has a capital of \$100,000, and is equipped with safety deposit vaults. It is open for business from 6 a. m. until 10 p. m.

GASOLINE MOTOR PLOWING IN MINNESOTA

Interesting tests have been made recently on the state experimental farm at Minneapolis, Minn., to determine the utility of the gasoline traction engine for plowing. The illustration shows the engine pulling 12 plows and cutting a furrow 14 ft. wide by 6 in. deep. This was accomplished while traveling at a rate of three miles per hour, a single man operating both the engine and the plows.

According to the reports from the farm, the large, high wheels of this engine will not sink into the soil of the stubble field as deep as an ordinary buggy with one man in it, and it is also claimed that ground of the nature found in Minnesota and North Dakota can be plowed at a fuel consumption of no more than one gallon per acre, if the land is level and free from stone.

Gas engines are being used to a great extent on Alaskan mining properties.



Motor Plow Cuts a Furrow 14 Ft. Wide

MOVING RUNWAYS CARRY HOTEL WAITERS

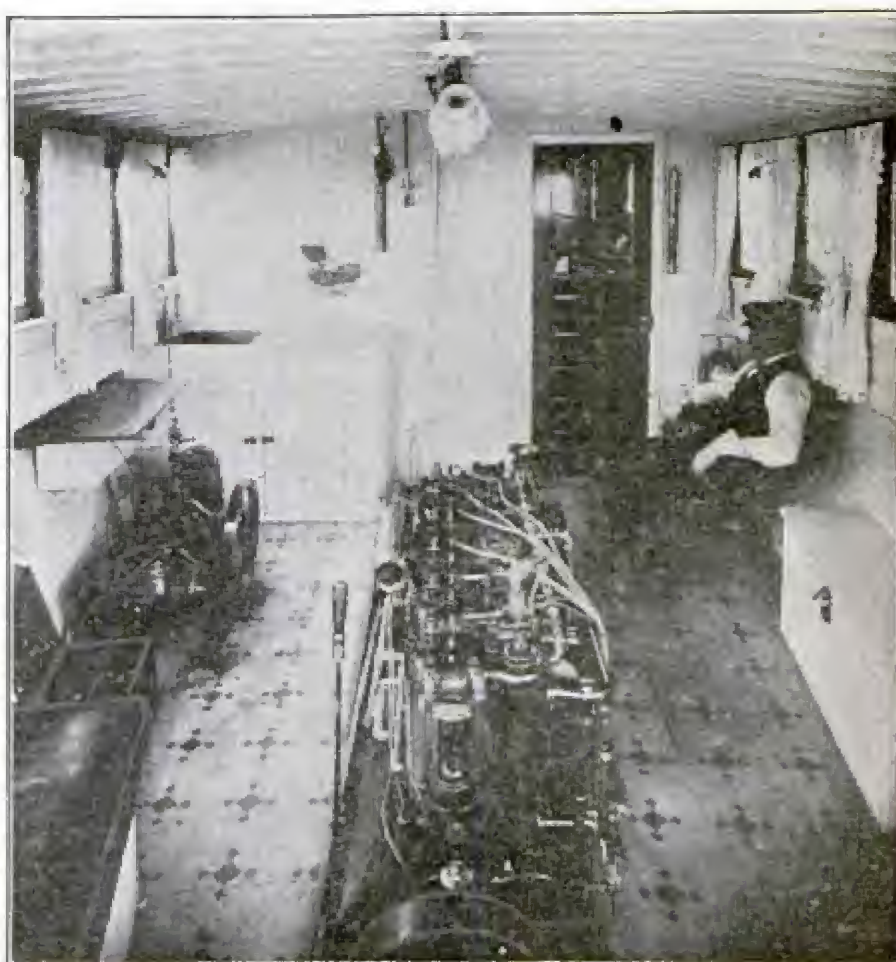
It is a strange fact that one of the greatest conveniences possible in the working mechanism of a hotel is being successfully introduced in foreign hotels, and, although manufactured in New York, is only beginning to be heard of in the United States. It is known as an "escalator," and is a moving runway or stairs for carrying the waiters from the level of the kitchen to upper dining rooms. Less than a year ago one of them was shipped to a leading hotel in Stockholm, Sweden, and sometime later another one to a hotel in Buenos Ayres. Others are being prepared for shipment to hotels in Europe. Although American hotel proprietors seem to have been behind in realizing the advantages of the device, it is now awakening much interest among them.

AUTOMOBILE VS. RAILROAD

One day last summer a railroad official stationed himself for a day at a highway crossing on his line on a route leading to a series of summer resorts, none of them of large size. He counted the passing automobiles for the day, and, making allowance roughly for mere pleasure travel, he estimated, according to the Railroad Age Gazette, that the loss to his road in fares for the day was \$350. The automobile means thousands upon thousands loss each year to a great number of the railroads of the country.

DESTROYING GOPHERS

The implements shown in this illustration are being used to a great extent in destroying gophers and other



This is the engine room of a fast 50-ft. cruising gasoline launch. It is as neat and compact as the main cabin. On the left side is shown the little engine and dynamo of its electric lighting system.

rodents in California. The implement at the left of the illustration is filled with a chemical that makes a poisonous



gas. Working the bellows on the top forces this gas through a hose into the holes of the rodents, thus killing them. The second implement is filled with damp straw and set on fire. A bellows which fits into an attachment on the top of the receptacle blows the dense smoke through a tube which is inserted in the ground near the opening of a gopher run and covered with earth. This fills the little subterranean passages with the smoke.

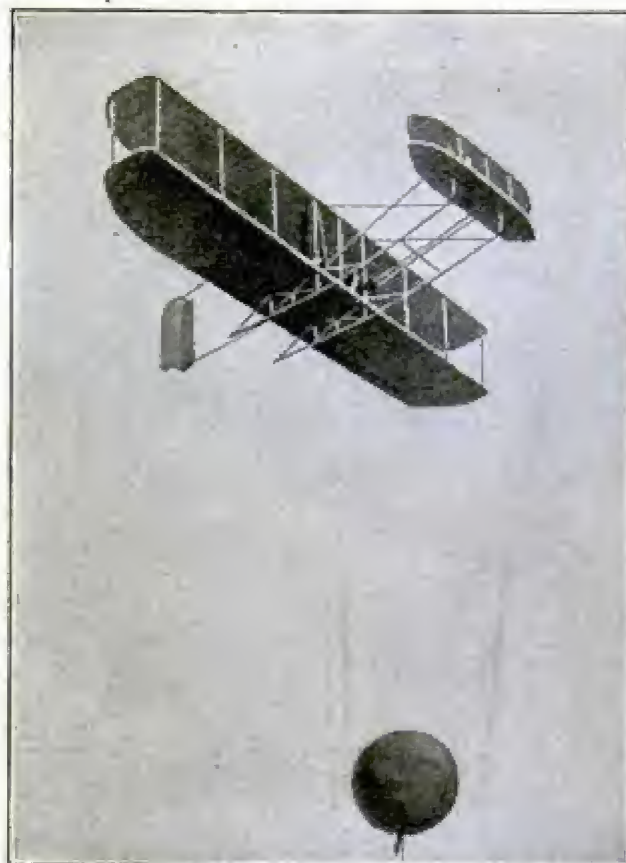
BURNING OF THE "SARDINIA"

One of the most terrible shipping disasters of the past few years occurred a couple of months ago when the passenger steamer "Sardinia" burned as she was leaving the harbor at Malta. For an hour and a half the ship circled helplessly close to the shore, and was finally beached, her commander being killed immediately after by a falling mast. The Arab pilgrims on board, of whom there were 142, became frenzied, many of them jumping into the water where they were cut to pieces by the ship's propellers or drowned. In all 97 lives were lost. The illustrations show the ship immediately after the fire broke out and in full blaze.



WRIGHT MAKES NEW RECORDS

As a fitting finish of a year that raised the Wright brothers from what



Passing Over Captive Balloon

the world considered a pair of mere pretenders to what the world now considers its greatest aviators, Wilbur Wright established two new records at Le Mans, France, on December 18. The first of these was gained by flying through the air for 1 hour, 53 minutes and 59 seconds. The best previous record was 1 hour 31 minutes, made by Wright on September 21. This flight, as well as a number of previous flights, gave him undisputed claim to the Michelin cup, which is the prize for the longest aeroplane flight for the year 1908.

In the afternoon Wright made another flight, notwithstanding the fact that the wind was blowing in gusts that reached a velocity of 20 miles an hour, and soaring 50 ft. above a captive line of balloons 300 ft. high, captured the height record which assured him the prize of the Sartho Aero Club.

In the evening of the day on which Wright won his double victory, the Aero Club gave a banquet in his honor.

AN AMERICAN GIBRALTAR

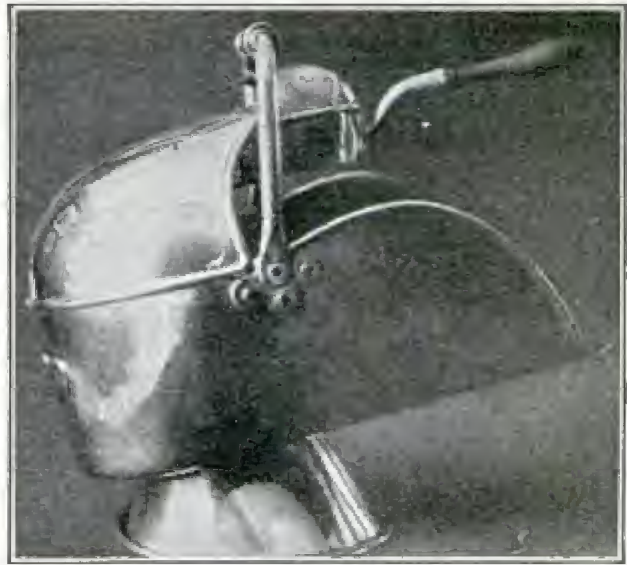
Reports from Honolulu state that tunnels are being run through the rim of the crater of Diamond Head to connect the batteries on the outer side of the crater with the inside. By means of these tunnels the gunners will be able to reach the points of observation from the inside of the crater.

BOSTON'S NEW SUBWAY HAS MANY FEATURES

The new subway under Washington street in Boston has many interesting features, one of which is in the fact that it is the most costly line of railroad thoroughfare in the world. Its total length is only 5,676 ft., a couple of hundred feet over a mile, yet its total cost was \$10,000,000, which is approximately \$1,762 per running foot. Of this amount \$7,500,000 was for engineering and construction and in payment of property damages.

The bore is almost straight, avoiding disagreeable turns, and its deepest part is 48 ft. below the street level. Above it at this point is the Ames building, which is 200 ft. high. The tunnel also runs under the historic "Old South Church." Its construction is the fourth step in the solution of the transportation problem in Greater Boston, and its use is confined to elevated trains alone, the trains running up to the elevated structure at both ends of the tunnel.

The arrangement of the interior and the stations is most interesting. It is white tiled through-



This brass coal box was made from the dome of a locomotive. The effect is rather artistic, and highly polished old brass is now a fad.

out, with different colored schemes in handsome mosaics for each station, as



The Subway as it Passes Under the Historic "Old South Church"



One of the 350-Ft. Platforms

additional distinguishing marks, and its construction and fittings are absolutely fireproof. The ticket booths are constructed of sheet copper, and all booths for telephones, news stands, etc., are set into the walls, leaving the platforms clear for traffic. The platforms, which are of concrete, are 350 ft. long, accommodating 8-car trains.

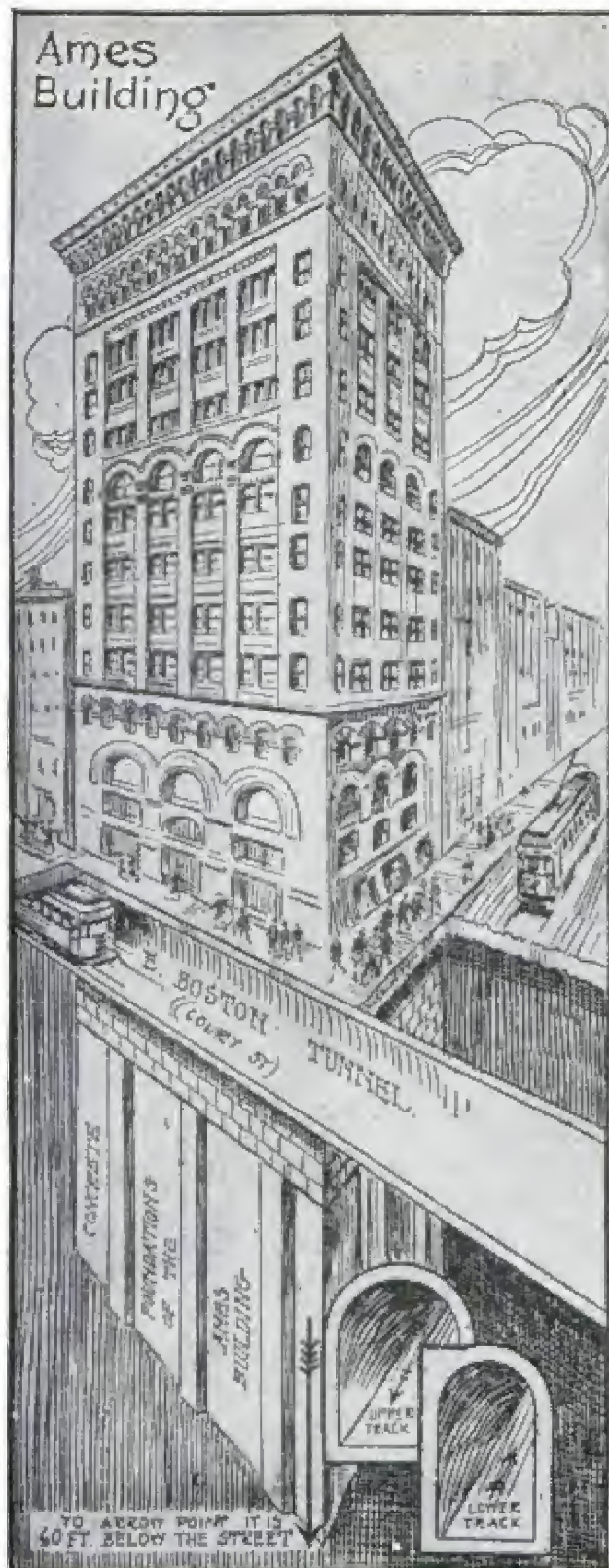
The system of ventilation is claimed to be the best ever devised, and hospital practices are followed throughout

to secure perfect sanitation. To this end, all corners are rounded off to prevent the collection of dust.

One of the hooded stairways or entrances to the subway, used where street space is cramped, is shown in one of the illustrations. The hood is constructed of concrete, studded with glass deadlights. At the deepest parts of the tunnel moving stairways are provided to save patrons from climbing. They will carry 3,600 persons down and



A Hooded Stairway Entrance to the Subway



Showing How the New Subway Passes Beneath the East Boston Tunnel

7,200 up per hour. The moving stairways that carry patrons up are made larger than those used for descent.

FLOWERS TO BEAUTIFY LONDON'S SUBWAY

London's underground railway stations, once noted for their dirt and gloom, are to be transformed by flowers

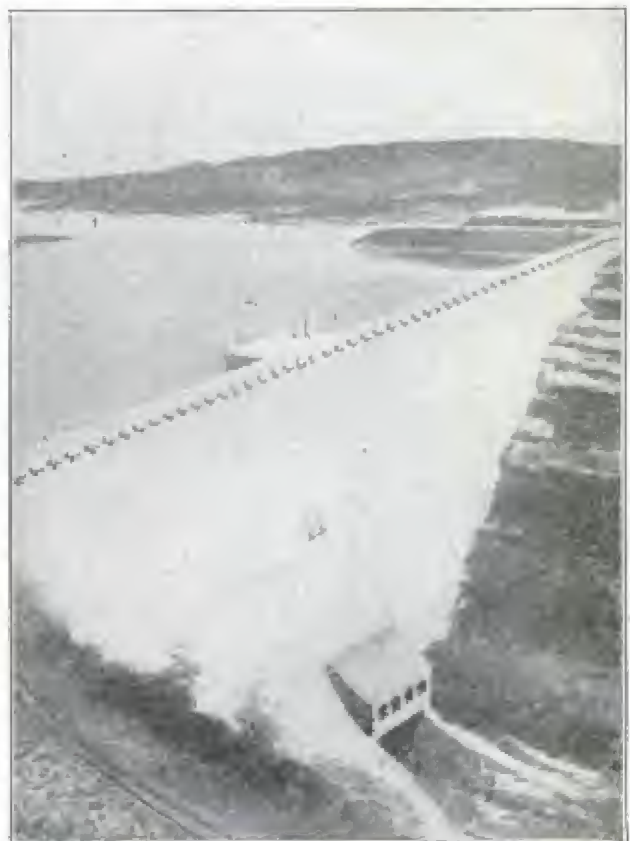
and baskets of ferns and evergreens. Keeping the stations clean became possible only when the system was electrified, and the floral decorations, although only as an experiment to start with, are expected to complete the transformation.

GREAT DAM AT SYDNEY

The great cataract dam at Sydney, New South Wales, Australia, constructed to increase the stored water supply of that city, holds back a supply of water which covers 2,456 acres at full supply level. The cost of the dam was approximately \$1,600,000, and 19,000 tons of cement were used in its construction.

The length of the dam is 811 ft., its height above the river bed 157 ft., its depth below the river bed 35 ft., and the maximum depth of stored water is 150 ft. The width of the dam at the top is 16½ ft., and at the bottom 158 ft. The total storage capacity of the reservoir is a little more than 25,000,000,000 gal.

To finish the work within the time limit the contractor had to resort to night work.



Huge Australian Dam



JAPANESE NEWSBOYS

The Japanese newsboy is as quick and fleet-footed as the American curbstone merchants of "Huxtra" afternoon papers, and just as precocious in his own language. The illustration shows five of them lined up by an American soldier to be photographed. The one from whom he is taking a paper knew enough English to call out "Papee" as he was passing.

ANTICS OF RUNAWAY WAGON

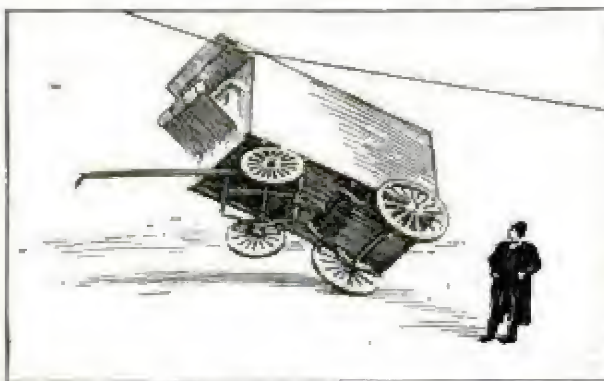
A great moving van, dragged at a terrific speed by frightened horses, suddenly leaped into the air in one of the streets of Ocean Park, Cal., balanced on one rear wheel—and stayed there. For a few moments the people who saw this queer antic of the wagon gasped in astonishment, but a closer view showed them that the reason for the vehicle thus balancing itself was not superhuman, but simply the result of the

front of the hood catching on low-hanging wires.

EXPERIMENTING WITH COAL DUST EXPLOSIONS

After hearing the evidence of a number of eminent mining engineers on the part played by coal dust in explosions in coal mines, and the means to prevent such explosions, the English commission on mines decided that available information upon these points was insufficient, and that further experiments were required before anything conclusive could be arrived at.

Accordingly, the Mining Association of Great Britain decided to raise the sum of \$50,000 by means of subscriptions from collieries, and to erect an experimental gallery in Yorkshire. The gallery was constructed so as to conform as nearly as possible to the conditions actually existing in a coal mine,



Big Van's Queer Antic



Explosion of Coal Dust in Experimental Mine—The Damage Caused by Such Explosions

and it consists of a wrought-iron tube, 7 ft. 6 in. in diameter, built of a number of boiler shells bolted end to end. The length of the gallery is 1,083 ft., and the results obtained by the explosion of coal dust within it are not dissimilar to those actually occurring in mines.

In preparing the gallery for a coal dust explosion, the coal dust and stone dust are distributed as required over the surface of narrow wooden ledges, running horizontally along the sides of the tube. The dust is raised and mixed with air by firing, by means of a fuse, a small cannon placed inside the tube. The cannon is charged with 4 oz. of blasting powder. This discharge is followed by the explosion of a larger cannon placed further in, charged with 16 oz. of blasting powder. The report of the resultant explosions of coal dust have been heard seven miles distant.

The first illustration shows the gallery at the moment of a coal dust explosion, and the other shows the damage caused. By these experiments it was found, for one thing, that until the coal dust zone exceeds 18 ft. in length, fire only occurs, no explosive force being manifested.

NEW INVALID'S BED HAS MANY FEATURES

The accompanying illustrations show different positions of a new invalid bed, constructed and patented by a Californian inventor. The bed is so devised that the patient can be changed

to almost any position by the turning of a number of cranks. One crank gradually raises the patient into a sitting posture, another raises the patient from the mattress so that the bed clothes can be changed, or lowers him, when the mattress and springs are removed, into a bath. Another crank turns the patient from back to side.

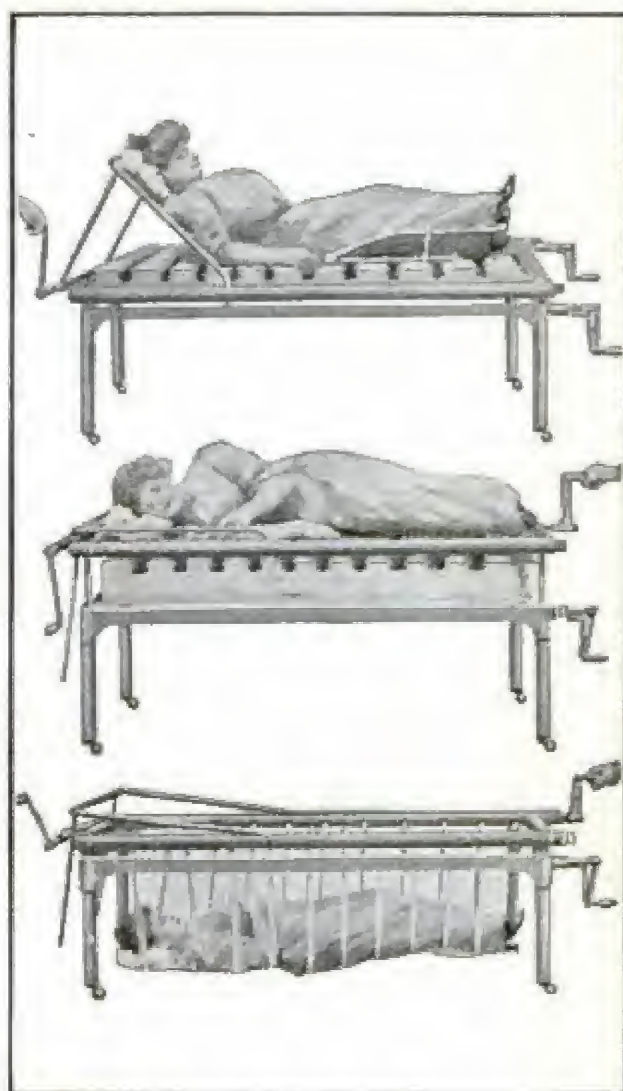
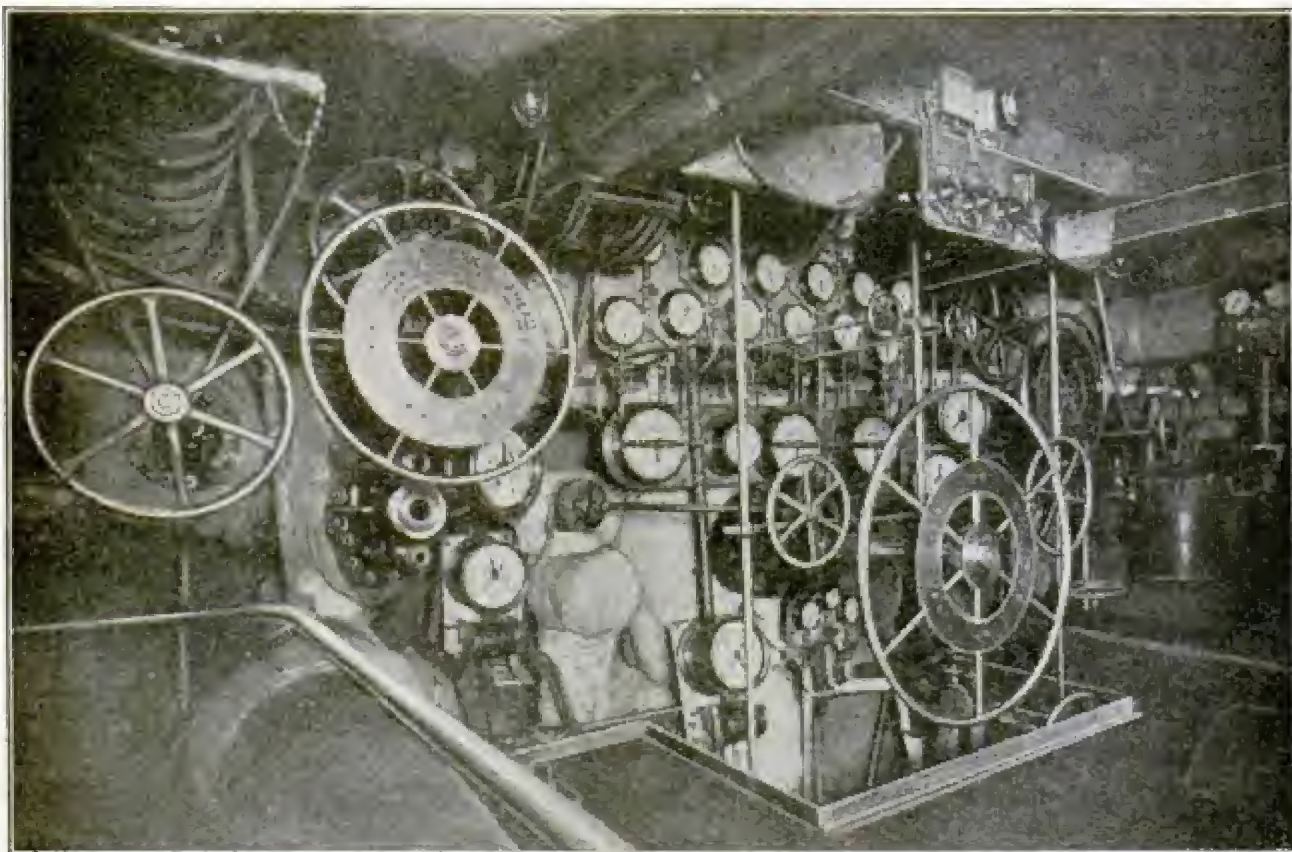


Fig. 1—Back Rest. Fig. 2—Raised to Remove Mattress. Fig. 3—Lowered into Bath



Courtesy Marine Engineer

This illustration of the interior of the engine-room of the British destroyer "Tartar" shows the starting platform and the arrangement of steam valves, steam and oil pressure gauges, telegraphs, counters, etc. The "Tartar" is 270 ft. long, burns oil for fuel, and has a speed of 40 miles an hour.

The crank that raises the patient to a sitting posture also makes a bolster to lean against. The device by which the patient is raised above the mattress is a frame with cross straps, covered with rubber. When not in use these straps fit into grooves in the mattress, as shown in the illustration.

The cranks are held by spring clutches and work noiselessly. The movements are made slowly and so evenly that a sleeping patient can be moved from one position to another without being awakened. In addition to these features, the legs of the bed are of telescopic design, making it possible to incline the bed with either the head or the foot elevated. There is also an attachment that can be used as a leg rest, and it will hold the leg in any position, either elevated and crooked at the knee or in a straight incline with the foot elevated.

The International Association of Aeronauts, at its meeting in London, decided in favor of the Swiss balloon "Helvetia" as the winner of the race from Berlin last October.

HEART-SHAPED SAUCEPANS SAVE GAS

The heart-shaped saucepans shown in this illustration were not designed for sentimental reasons, but for a reason that has to do with economical house-keeping—the saving of gas. The round saucepan is still supreme when only one is required on the range, but when two are needed, the sides do not fit together. Three heart-shaped saucepans can be fitted together on a range, as shown in the illustration, and no space is wasted. For simmering purposes three sauce-

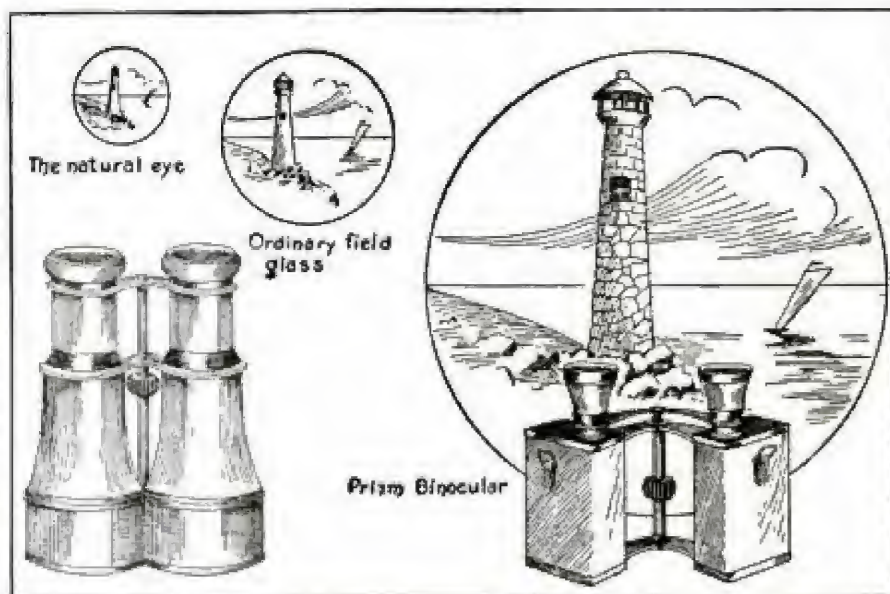


Heart-Shaped Saucepans

pans can be placed over one burner, the pointed ends of each receiving enough heat to keep their contents hot.

THE POWER OF BINOCULARS

There is probably no part of a navigator's outfit that a ship's officer would miss more than his marine glass or binocular, unless it be the ship's compass. This drawing shows the relative nearness of a lighthouse as seen through the natural eye, the ordinary field or marine glass, and the prism binocular. It has been said of some captains that, with a good marine glass at their eyes, they have absent-mindedly tried to talk to friends among the officers of a ship passing a couple of miles distant.



RISE AND FALL OF WATER IN THE NILE

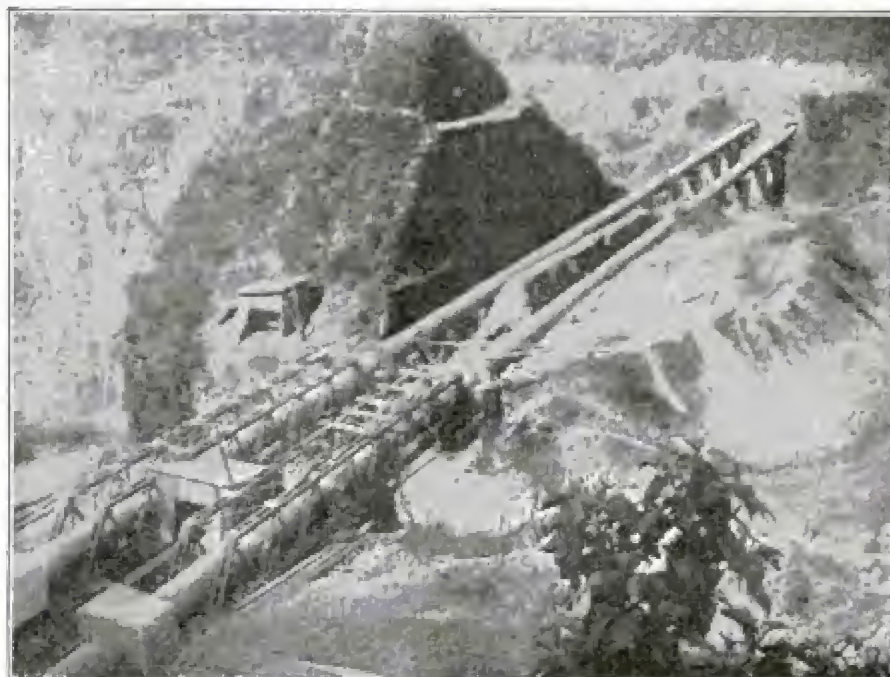
The Nile flood of 1908 was a high one, but by no means remarkably so, although the highest since that of 1898. On Sept. 10 the water reached

a height of 306 ft. above sea level, which is only 1 ft. above the average high Nile, but every foot means considerable. In Cairo many cellars were flooded, not from overflow of the banks of the river, but from the infiltration of water through the soil. At Assouan, where the great dam is situated, the

A MEXICAN POWER-PLANT PIPE-LINE

The hydro-electric power plant at Necaxa, Mexico, has been developed to such an extent that a load of 60,000 hp. is now being supplied. Mexico, like all tropical countries, has a dry and a rainy season, and consequently its rivers have a very irregular flow. A great reservoir is therefore necessary for this power plant, and the water is fed from it through two pipe lines, each of which is 6 ft. in diameter. The total head of water is 1,350 ft., giving a pressure at the wheel nozzles of 580 lb. per square inch.

The construction of the pipe line is shown in this illustration.



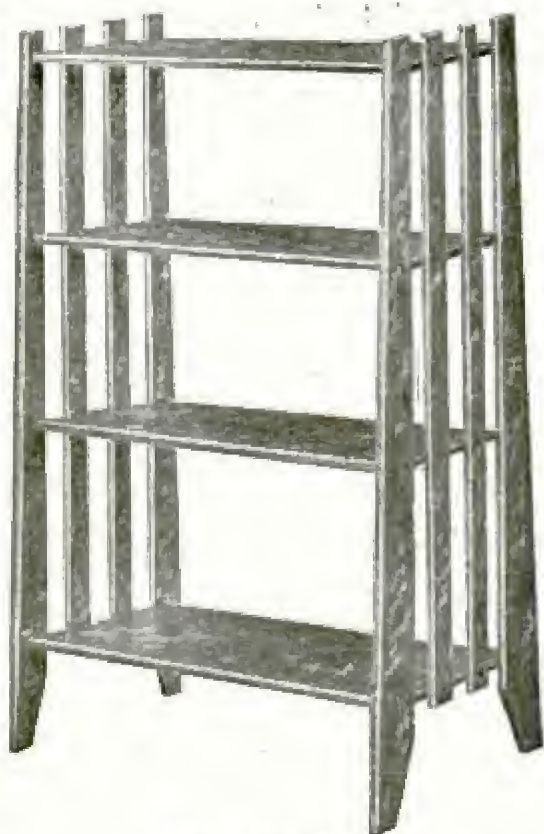
readings of the height of the Nile above the sea level have shown during the last 30 years an average low Nile in June of 278 ft. 8 $\frac{3}{4}$ in., and an

average high Nile in September of 305 ft.

The popular idea that the higher the annual flood the better for Egypt is a tradition of the past, although an exceptionally high Nile gives promise of a good supply of water during the low stage of the following summer, which is of great value to the country.

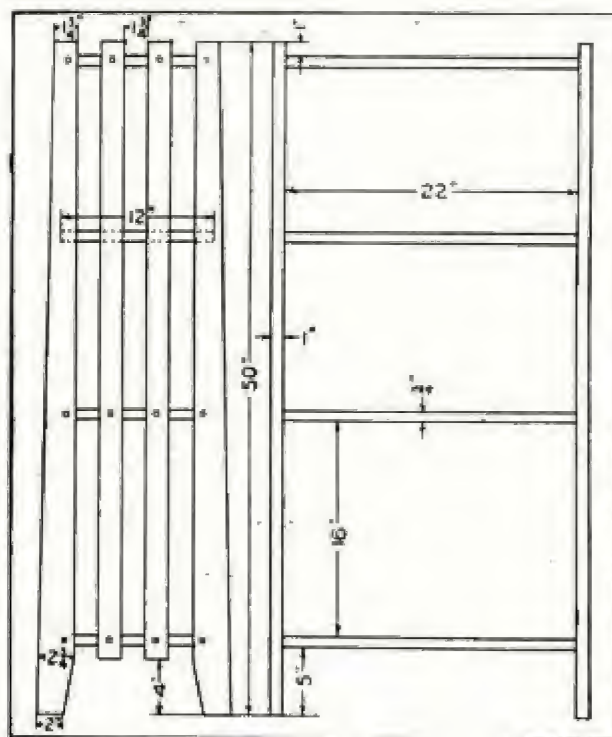
HOME-MADE MISSION BOOK RACK

When making the book rack as shown in the accompanying photograph use quarter-sawed oak if possible, as this wood is the most suitable for finishing in the different mission stains. This piece of furniture is very attractive and simple to construct. The upper shelf can be used for vases or a plant of some kind, while the lower shelves afford ample room for books and magazines.



Light but Strong

The slats and legs are fastened to the shelves with 2-in. round-headed brass screws. These can be purchased from any hardware store. One screw is used at each joint of a slat and shelf which calls for 32 screws in all. Holes should be bored into the slats and legs in which



Details of Stand

to insert the screws. This will keep the wood from splitting. The dimensions are given in the diagram sketch, although these may be changed to suit the requirement of the builder. If no glue is used on the joints when setting up, the rack can easily be taken apart and put in a small bundle for moving.

FIRE LOSSES ARE OVERWHELMING

Almost every day the newspapers in different parts of the United States report great destruction by fire, but just how great the annual loss is very few people realize until they face the actual figures. During the year 1906 the fire losses in the United States reached a total of \$518,611,800, or more than \$6 per capita. This was, of course, an unusual year, the San Francisco fire alone having cost \$350,000,000. The average yearly fire loss in the United States from 1897 to 1906 was \$2.70 per capita, while in six of the leading European countries the average per capita fire loss for 1906 was only 33 cents. The fire losses in the United States within the past 10 years aggregate \$1,946,705,620, and had the country shown no more of a loss than the European countries, 90 per cent of this would have been saved.

LARGEST CONCRETE SPAN IN THE WORLD



Looking Between the Double Arch



The Arch Is 133 Feet High

The great concrete bridge across Wissahickon Creek, in one of the suburbs of Philadelphia, containing the longest concrete span in the world, has recently been completed after a little less than two years of work. The main arch has a clear span of 233 ft. and rises to a height of 133 ft. above the creek. This great span, as well as the shorter ones, was constructed of two parallel arches 16 ft. apart and bridged together by steel girders, thus saving nearly 50 per cent in material used. The double arch feature is clearly shown in the illustrations, one of which, without explanation, would be taken for some curious type of architecture rather than the arches of a bridge.

The amount of concrete used was 21,000 cu. yd., and 370,000 ft. of lumber was used for the molds and falsework. Each arch of the main span is 21 ft. thick at the shewback, and 18 ft. thick at the crown. The connecting links between the arches are 20-in. steel beams, entirely inclosed in concrete.

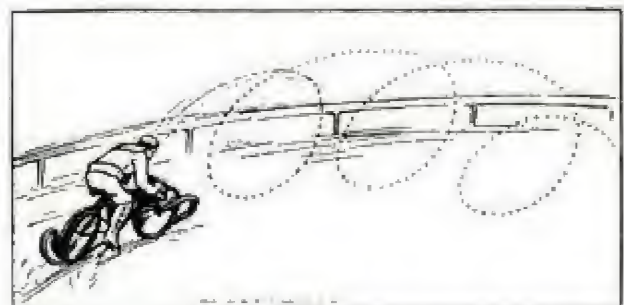
One of the features of the construction was the method of building the falsework. The lower piers of this tem-

porary structure were of steel, resting on temporary concrete piers sunk in the bed of the creek. When the work was completed these were blasted away.

—♦♦♦— TURNS THREE SOMERSAULTS ON MOTORCYCLE

While racing around the Ascot Park track on a motorcycle at a 66-mile an hour clip, Raymond Seymour, a mere boy, but one of the best motorcycle racers in Los Angeles, turned three complete somersaults with his machine, and escaped injury.

The cause of the accident was a soft spot on the track which caused the machine to skid. He swung the front wheel around to right himself, but the



Turns Three Somersaults and Escapes

wheel went too far and dug deep into the track. Twice the 160-lb. racer turned end over end, its rider sticking to his seat. Then he was shaken loose and thrown to one side as the machine was making its third somersault. The one idea of Seymour when he struck the track was that he was directly in the path of a racing automobile and he jumped to his feet and ran to the inside fence. His right knee was skinned by the fall and his right wrist slightly sprained. Otherwise he was as whole as when he started out.

BUILDING TUMBLED OVER BY ELECTRIC CAR

With a result as complete as that of the recent earthquake in southern Italy and Sicily, a large interurban electric car on one of the Pasadena, Cal., lines, ran into the steel pillar which supported the center of the brick-veneered second-story front of a car barn and tumbled that part of the building completely



Building Tumbled by a Collision

down. The second story was occupied by offices and several men who were in them came down with the wreckage, but escaped injury.

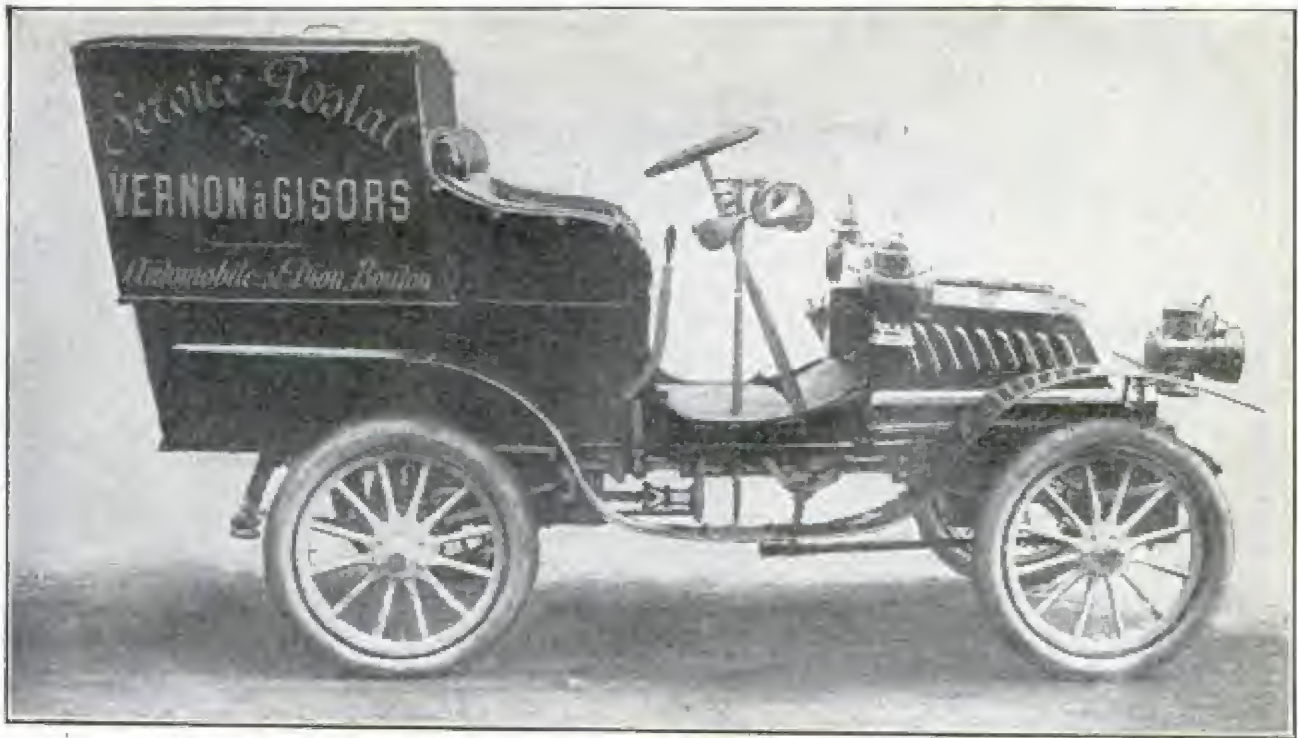
The completeness of the destruction was remarkable, as is shown by the illustrations, one of which was taken a few weeks before the collision occurred, and the other a short time after.

EUROPEAN AUTOMOBILE POSTAL SERVICE

Recently in France there has been started a number of automobile postal lines for the rapid delivery of first and second class mail to postoffices in the rural districts, and it is expected that the high-speed motor car will find more extensive use in this line of work in the near future.

The accompanying illustration, Fig. 1, shows a French auto used in the postal service between Gisors and Vernon, regular trips being made between these cities and the mail collected from the various towns and villages for a distance of about 20 miles. The round trips are made at night, the car leaving Gisors at 10:15 P. M., returning to the starting point at 2:45 A. M. These French postal motor cars carry from 400 lb. to 600 lb. of mail at a trip.

In Bulgaria there has been in operation for some time a similar postal motor car service which has given excellent satisfaction. Two of the first Bulgarian postal cars are shown in the accompanying illustration, Fig. 2. These cars are equipped with 8-hp. motors. The service is being rapidly extended and high-speed postal cars of the type shown in illustration Fig. 3 are now being utilized in Bulgaria. These cars are equipped with 15-hp. engines and are considerably larger and faster than the first postal automobiles employed. In other European countries, as well as in the United States, motor cars will undoubtedly be employed in the near future for rural postal delivery, as well as for the transportation of mail in cities between the main office and sub-stations.



COUNTING THE POPULATION OF UNITED STATES

The Taking of the Census Is a Great Business Project—Remarkable Time-and-Labor-Saving Machines Expected to Work a Miracle of Efficiency—Stupendous Task Will Cost Government Nearly \$14,000,000

By Waldon Fawcett

Although two years will elapse before the beginning of actual enumeration, preparations are already far advanced for the national census of the United States for 1910. The counting at the end of each decade of every man, woman and child in the republic is the greatest business project Uncle Sam is called upon to undertake.

Realizing that with the continuous rapid increase in population, the next census will be a record breaker in every respect, the officials sought to take time by the forelock and secure at the last session of Congress an appropriation of money that would enable preparation for the census proper. The desired appropriation was not secured at that time, but there is reason to believe that the money required will be available in a few months. The officials of the bureau of the census have not waited for the Congressional appropriation and are well into the administration details. Of even more importance, the mechanical experts of the bureau have been gradually evolving a number of wonderful new machines which will enable the compiling of the census returns more quickly and more accurately than has heretofore been possible. This work has been made possible by the creation of the permanent census bureau, authorized by an act of Congress in 1902. Each census in the past has been an independent enterprise with all the disadvantages that might be expected to result from



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Key Board of the Card Punching Machine



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This Machine Classifies the Holes and Counts Them

entrusting such a gigantic task to officials not familiar with the work, and employes wholly or partly inexperienced.

The coming census will entail upon the nation an expense of about \$14,000,000. Of this amount \$12,500,000 represents the anticipated outlay for the canvas of the country's population, and \$1,500,000 for the permanent maintenance of the bureau. In addition to this, S. N. D. North, the director of the census, will ask Congress at its present session for \$675,000 to purchase a site and to erect a 6-story home for the census institution.

Although the population may have increased 15 to 20 per cent since the census of 1900, entailing a proportionate increase in the volume of work required, it is the belief of the officials that they will be able to complete the coming census at a cost but little, if any, in excess of the last census. This economical miracle will be made possible through the introduction of remarkable machines for the saving of time and labor. It is expected that by the aid of these new machines a force of clerks no larger than that employed 10 years ago will be able to turn out one-fourth and perhaps one-half as much more work as was accomplished in 1900.

Mechanical mathematicians of one kind or another have been used in the U. S. census office since 1870, but the system of electric tabulation which will be employed for this census will be so far in advance of all predecessors in the matter of machinery employed, as to mark a new era. The census will be compiled by the card index system, with a card for every man, woman, and child in the country, but it will differ from the card index systems found in the average office in that the information will be recorded by punching holes in the cards instead of records with pens or typewriters. The positions of the holes on each card will indicate facts relative to the individual whose biography the card holds.

This method requires the use of two main classes of machines. First, there are the machines that punch the holes in the cards as above described, and, secondly, there are the tabulating machines that take these cards after they have been punched full of holes, and, solely by mechanical means, add, classify, and make up their totals. Both of these machines are shown in the illustrations.

The punching machine is built on the plan of a typewriter, and has 240 keys. The mere depressing of any desired key and the switching of an electric



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**Old Style Punching Machine Worked by Hand
—Old Style Tabulating Machine**

current serves to punch the holes as needed, and with it any of the clerks in the bureau can punch from 3,500 to 4,000 cards per day, as compared with the limit of 900 cards a day by the old punching machine, which also is illustrated. Thus each key on the board punches a certain hole on the cards, and these holes designate whether the resident is a male, female, native, foreign, white, colored, married or single, a barber, blacksmith, lawyer, servant, teacher, or one of the many other things that a person might be.

In the new tabulator, as in the one used during the last census, the work is

performed by a pin box, equipped with a pin for each possible hole in a card. Each of these needles is set on a fine spiral spring, and when the box is brought down over a card the needles which meet the unpunched surface are withheld, while those that pass through the holes make an electric contact and cause one or more counters or dials to register. Thus the machine mechanically keeps count of the cards and the holes upon them, and a printing attachment delivers the result on a neatly printed slip. In the old machine the counters had to be read and the results recorded by hand, a proceeding productive of many errors and the loss of much time.

ENGLAND PLANS GREAT FORESTS

The royal commission appointed to consider the planting of great tracts of forest in Great Britain, recommends the planting of 9,000,000 acres in England, Scotland, and Ireland during a period to extend over 80 years, about 150,000 acres to be afforested annually. This task would give work to 18,000 unemployed during the winter months, thus helping to solve another problem.

The report advises the asking of parliament to grant the necessary power to finance the scheme by a loan, the interest of which would be defrayed by taxation. It is estimated that the forests would be self-supporting after the fortieth year, and that after 80 years their income would reach \$87,500,000.

AERIAL FLIGHT POSSIBLE WITHOUT GASOLINE MOTOR

According to Wilbur Wright, the flying-machine was not dependent on the gasoline engine. "It has undoubtedly helped us, but if they had not been developed we could have flown with the steam engine. There are steam engines built now sufficiently light to enable me to fly with them."

EDITORIAL

The reading pages of this magazine go to press so long in advance of its publication day that comment on current happenings is seldom timely. However, an event which will be mentioned in the reference books 500 years hence may even yet be discussed, although the rapid whirl of time in this strenuous country is already making it a small object on the world's horizon. The recent earthquake illustrates how, at will, mercy or punishment may pour forth from the same source.

The picture is a pleasing one of those proud engines of destruction, members of our own and other Nations' fleets, hastening with "full speed ahead" to the aid of quivering Sicily, while beneath the waters of the sea a golden stream of treasure flowed for days.

In the past, when intercourse was slow, nations flew to war in an hour; now their sympathies respond almost in a minute. Only fifty-one years ago weeks would have passed in bringing the news to our shores, and many more weeks must have elapsed before assistance could return.

Thousands upon thousands of Messina earthquake survivors owe their lives to the inventor of the telegraph.

* * *

The province of the aeroplane, in the prediction of Wilbur Wright, who of all others may speak with authority, is not to be in the realm of commercialism, but of the army. For a time it will serve as a sport to a certain class of the adventure loving, but as such, like other fads, will be neither general nor lasting. Its greatest field of usefulness, says Wright, will be in replacing, largely or entirely, the present horse troops. This winged cavalry of the air will be able to do most things possible to present mounted forces, and many they cannot perform.

A well developed airship recognizes no difference between a creek and a Grand Canyon. Yet a company of aeroplanes would not be an entirely satisfactory substitute in an inauguration parade down Pennsylvania Avenue.

* * *

Could anything be more prosaic and unsightly, as it crawls and crunches along, snorting out cinders and smoke, hissing meanwhile like some mammoth reptile, than a steam roller. Even the small boy, whose discernment of what is worth watching is highly developed, scorns to waste his time upon one. And yet the Turks have gone wild over a steam roller. Turkey never knew a steam roller until her recent constitution, which let it in along with the telephone and a few other things. If the Sultan had walked a tight rope over one of the streets of Constantinople the event could scarcely have caused more excitement. Great crowds, including oldest settlers, merchants, and the well-to-do, swarmed around the mechanical curiosity by hundreds; some immediately in front, others specially fortunate at either side, and still other "citizens on foot" stretched out in a long procession, which slowly squirmed its way like a monster snake. Barring loss of life, the trip resembled nothing as much as the March of Juggernaut.

All of which goes to prove that however unsightly and objectionable a thing may be, there is somewhere a zone where it looks good to people.

With all the mechanical improvements, sanitary and time-saving, which have been adopted in modern packing houses, it is strange that the same brutal, repulsive method of killing is still employed. Some electrical method would seem to be the best, because so adaptable and easy of control; and yet while almost every conceivable use has been made of electricity, even in things insignificant and for trivial amusement, the packers continue in the old way.

A French scientist, Dr. S. Leduc, who has been at work for some time, announces a painless method of killing. The animal is stood on an insulated platform, and electrodes placed, one on the forehead and another at the extremity of the spine. Direct current of low voltage is used, the discovery consisting in certain frequent interruptions per second. As soon as the current is turned on the animal falls senseless, and is bled.

* * *

An earthquake is the one convulsion in Nature which seems to defy man. Lightning usually betrays its presence with angry clouds, but can be diverted by means of conductors; a rapidly falling barometer warns the mariner of the coming storm while yet the sky is clear; tornadoes announce their own approach, from which cyclone cellars afford havens of safety; even tidal waves are visible for some distance in the day time; cyclones can often be predicted with considerable certainty as to general districts; and volcanoes rumble and smoke for days before they erupt.

But the earthquake is the unexpected, uncontrolled, resistless monarch of them all. True, the seismograph tells us a quake of certain severity has occurred at such a moment, somewhere, at a distance of so many hundreds or thousands of miles; yet we must wait on wireless or cable to learn where, and whether it was on land or beneath the sea.

We build snowsheds to protect our railroads from avalanches and land slides; dams to hold back sudden floods from cities and farms; frosts can be tempered with bonfire smoke; we drink ocean water when distilled, and live; deadly plagues are controlled and stamped out.

The earthquake defies us.

We climb our highest peaks, and plant a signal station there, and then send balloons still higher up, hoping to catch a whisper of storm warning from Old Boreas. Perhaps some day we will reverse the process and bore as many feet into the bowels of Old Earth, and wrest from her safety-vaults advance reports of earthquakes in formation.

H. H. WINDSOR.

THE PRACTICABILITY OF SUBMARINES

In and around harbors, and along the shore, the value of submarines is indisputable, but whether or not they can be used for more strenuous service seems still to be a question. Many critics believe not, and claim that the submarine is more dangerous to the crews operating them than to the crews of the enemy's ships. Others say that

it is one thing to stand up, facing bullets and shells, fighting for one's life in the open air, and quite another thing to be caught in a trap and drowned without being able to help one's self. Yet all the powers are building such vessels, and it seems that there are enough men not afraid of such a death to man them.

STEAM PROTECTS SAFE FROM ROBBERS

The great vault of the National City Bank in Wall street, New York, made of 400 tons of steel, and 75 tons of fireproofing cement, is protected against invasion by a unique system of steam pipes, as well as the more ordinary methods. All around the safe, within and without, are brass pipes so arranged that at a moment's notice the interior and its approaches can be converted into a scalding, suffocating deathpit.

The purpose of the steam pipes is not so much to protect the vault from burglars as from riots, should such ever occur, and even though all the employes of the bank should be compelled to flee before the doors of the safe could be closed the steam could be turned on by anyone initiated. The result would be that no one could withstand for an instant the death-dealing blast.

REFRIGERATOR SHIPPING BOX FOR FRUIT

A large fruit grower in the State of Washington who experienced heavy loss from berries spoiling in shipment has invented a refrigerator shipping case. The case is built to contain 54 quart boxes placed on trays in airtight compartments, and in a compartment above the berries is room for a 25-lb. cake of ice, making a total weight of 67 lb. The crates must be iced every



54-Quart Shipping Box

24 hours. This is done by the railroad company. Under these conditions Washington berries have reached the Chicago market in salable condition.

THE HANGING RAILWAYS OF SWITZERLAND

There is no range of mountains in the world more swarmed over by tourists than the Alps, and no country with as many different kinds of mountain railways as Switzerland. To reach the



The Air Line

highest pinnacles of the famous Alpine peaks is only possible to the small army of intrepid climbers who have their ranks more or less depleted each year by accidents and recruited again by new enthusiasts, but the lower levels are possible to all tourists by means of such railroads as the one here illustrated.

It is an overhead cable road that crosses a ravine between the famous Matterhorn and another mountain. The passengers in the cars can look down to the dizzy depth of 5,500 ft., and although the ride would seem dangerous and uninviting to the uninitiated it is absolutely safe.

Two cars are used, each of which carries 16 people, seats being provided for eight. The cars run on two sets of over-

head cables, one set being hung a considerable distance above the other. Two cables make an accident impossible should one cable break, either one being strong enough to hold the car suspended. If so desired the cars can be stopped anywhere on the cables.

HOW TO MAKE A TABOURET

Secure from the planing mill the following pieces and have them planed and sandpapered on two surfaces: For the top, one piece $\frac{7}{8}$ in. thick and 17 in. square. For the legs, four pieces $\frac{7}{8}$ in. thick, $4\frac{3}{4}$ in. wide and $18\frac{1}{2}$ in. long. For the lower stretchers, two pieces $\frac{7}{8}$ in. thick, $2\frac{3}{4}$ in. wide and $15\frac{3}{4}$ in. long. For the top stretchers, two pieces $\frac{7}{8}$ in.



Tabouret as Completed

thick, $2\frac{1}{4}$ in. wide and $13\frac{1}{4}$ in. long. No stock need be ordered for the keys, as they can be made out of the waste pieces remaining after the legs are shaped.

Begin work on the four legs first. While both sides of each leg slope, it will be necessary to plane a joint edge on each leg from which to lay out the mortises, grooves and to test the ends. It will be necessary to have a bevel square to use in marking off the slopes and for testing them. To get the setting for the bevel square, make a full

sized "lay out" or drawing of the necessary lines in their proper relation to one another and adjust the bevel to those lines.

From the joint edge lay out the mortises, grooves and the slopes of sides and ends of the legs. Cut the mortises and grooves first, then shape up the sides. Saw the sides accurately and quite close to the lines, finishing with the steel cabinet scraper.

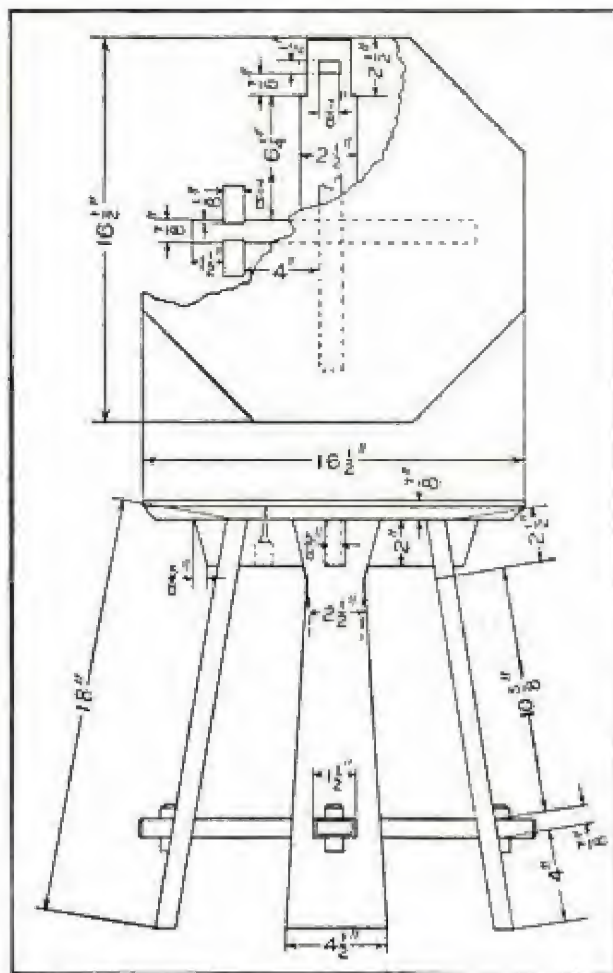
Next make the bottom stretchers. In laying out the cross lap joint, the working faces are both to be up when the joint is completed, therefore lay off one groove on the face of one piece and on the side opposite the face on the other. In gauging for depth, however, be careful to keep the gauge block against the working face of each piece.

In laying out the mortises for the keys, the opening on the top surface is to be made $\frac{1}{8}$ in. longer than on the under surface. The slope of the key will therefore be $\frac{1}{8}$ in. of slope to each $\frac{7}{8}$ in. of length. The drawing shows the mortise as $\frac{7}{8}$ in. from the shoulders of the tenon. This distance is the same as the thickness of the leg and to insure the key's pulling the shoulder up against the leg firmly, should any of the legs happen to be a little less than $\frac{7}{8}$ in., it is well to make the mortise slightly nearer the shoulder than $\frac{7}{8}$ in.

It is a good plan to lay out the mortise in the tenon at the same time the shoulders of the tenons are laid out. Otherwise the joint edge being cut off in making the tenon there is no convenient way to locate this mortise accurately.

Lay off the top stretchers according to the dimensions shown in the drawing. Observe the same precautions about the cross lap joint as were given for the lower stretchers, except that the joint edges are to be placed up in this latter case. Make sure the grooves are laid out in the middle before cutting. As a test, place the pieces side by side, examine the markings, then turn one of them end for end and again examine.

The grooves into which the legs pass are $\frac{1}{8}$ in. deep and must be very carefully cut. Their purpose is to give



Details of Tabouret

rigidity to the tabouret frame. Bore two holes in each stretcher for the screws that are to fasten the top in place.

Make the keys, scrape all the parts and sandpaper those that were not so treated at the mill. Use glue to fasten the tops of the legs to the top stretchers and assemble these parts.

The top is octagonal or eight sided. To make it, square up a piece to $16\frac{1}{2}$ by $16\frac{1}{2}$ in. Measure the diagonal, take one-half of it and measure from each corner of the board each way along the edges to locate the places at which to cut off the corners. Connect these points, saw and plane the remaining four sides. There is to be a $\frac{5}{8}$ -in. bevel on the under side of the top. Scrape and sandpaper these edges and secure the top to the stretchers with screws.

Much time can be saved and a better result obtained if the wood finishing is done before the parts are put together. Especially is this true if stain and filler are used.

A very pretty finish and one easily

put on even after the parts are put together is obtained as follows: Take a barrel and stuff up the cracks or paste paper over them so as to make it as near airtight as possible. In some out-of-the-way place put a dish with about 2 oz. of strong ammonia. Set the tabouret over this dish and quickly invert the barrel over the tabouret. Allow the fumes to act on the wood for at least 15 hours. Remove the barrel and allow the fumes to escape. Polish with several coats of wax such as is used upon floors. Directions for waxing will be found on the cans that contain the wax. This produces the rich nut-brown finish so popular in Arts and Crafts furniture and is known as fumed oak.

--- **DANGER SIGNALS FOR AUTOMOBILES** ---

At the recent road congress of automobilizing interests, held in Paris, the international caution-boards shown in these illustrations were adopted for all countries. The lettering on the boards will be in the language of the country in which the board is found, but the



GIVING WARNING OF A CULVERT



A RAILROAD CROSSING



APPROACHING A CROSS ROAD



SHOWING A TURN IN THE ROAD

symbols will be the same in all countries, thus making it possible for tourists to make out the meaning, even though not understanding the language of the country through which they are passing.

The boards are in the form of a disc, 26 in. in diameter, and the symbols and inscriptions are white on a dark blue

background. The board bearing the two white mounds gives warning of a culvert, the one with the railroad track and ties means a railroad crossing, the cross shows that a cross road is being approached, and the curved symbol warns that an abrupt turn in the road is about to be met with.

BIRD-LIKE FLYING-MACHINE MODEL FLIES

One of the most enthusiastic flying-machine inventors in this country is Prof. John A. Udder, of the geology department of Augustana college and Theological seminary, Rock Island, Ill. By use of the bird-like model shown in this illustration, Prof. Udder has



This Model Flies

demonstrated that he has designed a type of flying-machine that will fly. Three trials were recently made in the chapel of the college, and in each trial the model rose gracefully into the air and flew off the stage into the rear of the building. The motive power of the model is furnished by rubber bands, twisted to produce a high tension.

The machine is called a "rotopter" by its inventor, the title meaning rotating wings. These wings or propellers are two in number, situated on each side of the machine at the top. When propelled, they cut the air on a horizontal plane, thus producing the resistance against the air which causes the machine to rise. The propellers merely act against the force of gravitation, the forward motion being produced by the angle of the plane in the body of the machine.

Prof. Udder claims that it is a re-

markable fact that all aeronautic inventors have apparently overlooked the fact that the force of gravitation is caused to work in two directions by an aeroplane—both forward and downward. Thus, if propellers merely cause the machine to rise against the force of gravitation, it will move forward of its own accord without the necessity of propellers to force it ahead.

One of the features of Prof. Udder's invention is the fact that the propellers cause it to rise directly from the ground, thus making unnecessary the additional weight of wheels with which most flying-machines are burdened. Another feature claimed for the Udder machine is its ability to right itself. It is constructed so that the center of gravity is in the lower part of the machine, thus overcoming the tendency to capsize. A parachute arrangement is provided which will cause the machine to fall slowly when the propellers are stopped.

HOW BIRDS AND FLYING- MACHINES FLY

[Condensed from *World's Work*, London]

The action which enables bodies heavier than air to travel through the air is due to the resultant force of two thrusts, acting in almost opposite directions upon the structure or body, thereby imparting the necessary traveling motion in accordance with the angle and force of these two thrusts.

The first of these is the downward vertical pull of gravity, due to the weight of the body or structure, and the second is the lift exerted in an almost vertical upward direction. The direct result of these two thrusts, the first of which is provided by natural laws, gives forward or retarding motion to the body according to the angle of the upward lift, or in other words, according to the resistance to the gravitational fall of the body.

Supposing, for instance, that a body of 1-lb. weight is 1 ft. above the ground, thus imposing a constant vertical downward thrust of that body

equal to 1, and that a vertical upward thrust equal to 1 is imposed. The result will be that these two thrusts, exactly equal and exerted in exactly opposite directions, will counterbalance one another and that the body will remain perfectly stationary 1 ft. above the ground.

But if the upward thrust, still equal in intensity to the downward gravitational pull, is exerted in a direction not quite vertical, the body immediately moves forward in a direction towards the ground just below the horizontal, and if the upward thrust exceeds the downward pull sufficiently the resultant motion will not only be forward but upward as well.

It is thus apparent that all the time an upward thrust, sufficiently in excess of the downward pull of gravity, is exerted upon a body or structure heavier than air flying will be maintained if this force is applied in a direction in advance of the vertical. This is the simple and sole means by which a bird can fly in the air.



Miniature automobiles, if complete in every detail, as they must be if used as is this car, often cost much more to make than the average-sized car of the same make. This automobile was the smallest at the Savannah racing meet. It cost \$2,000.

POP IN TAW

Pop in Taw is the name of a game now attracting attention in England.



The Latest Craze

Several persons can play at the same time. Each player is supplied with a small flat wooden shovel, a steel cone, and five steel balls. The cones are set small end up, and the game consists in transferring the steel balls from the table into the cones, using only the shovel. The small end of the cone has an opening barely large enough to admit one ball at a time.

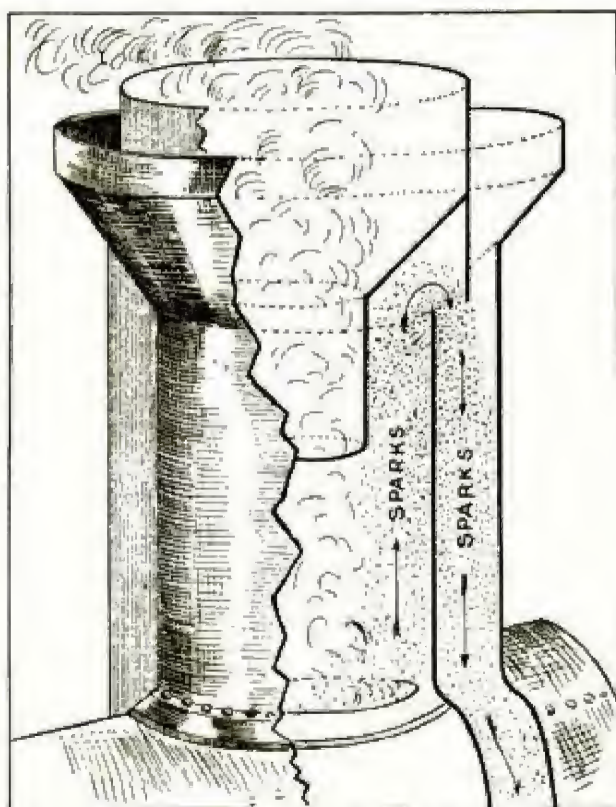
TELEPHONE CALLS ANSWERED BY MACHINE

A phonograph arrangement that will answer telephone calls has been invented by a Detroit man for use in offices of any kind, but especially in doctors' offices. The machine will repeat twice, to each call of the telephone, any message the person expecting to be called desires to impart to it. Before leaving his office, the doctor having

such an attachment to his phone, talks into the receiving tube of the machine the message he wishes to leave. When the telephone rings, this message is repeated to the person calling, announcing when the doctor will return, where he is, or any other message it has been provided with.

LOCOMOTIVE SMOKESTACK HAS SPARK SUPPRESSOR

A locomotive smokestack that will not emit sparks and cinders, invented by a Cincinnati tinner, has met with



Construction of Sparkless Stack

so much favor in the forestry department of the government that it may be used by railroads traversing forest districts. The forestry department has already requested the New York state public service commission to compel all railroads in that state to equip their locomotives with these stacks.

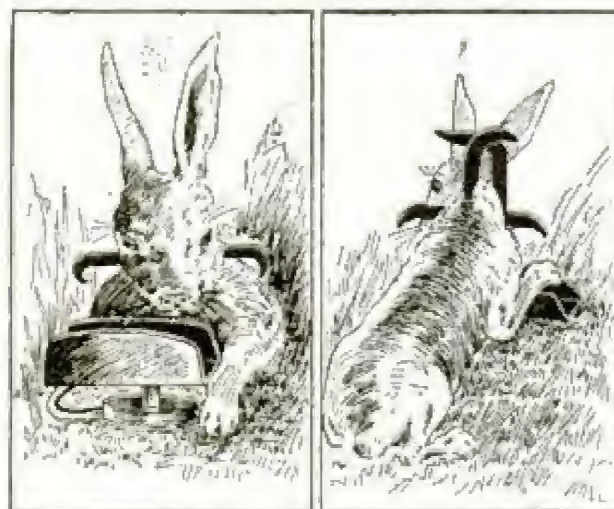
The principle from which the new stack is evolved is that all solids emerging from the smokestack of a locomotive hug to the sides of the pipe. A trap catches them at the top of the stack before they can escape into the open air and then sends them down two little chutes to the roadway.

Private tests at night on the Carrollton & Worthville railroad in Kentucky, extending over more than a month, are claimed to have proved the invention a complete success. There has been a crying demand for a device to do what is claimed for this for many years, as sparks from locomotives have undoubtedly caused the destruction of millions of dollars' worth of timber, grain, orchards, etc., by starting fires. So serious has this menace become in New York state that its officials have been advocating the substitution of electric locomotives to pull all trains running through its forest preserves.

RABBIT TRAP THAT CATCHES THE NECK

The plague of rabbits in Australia is so damaging to crops that the Trap-makers' Association of that country is one of its most important bodies. The rabbit trap shown in this illustration, the invention of an Englishman, was recently passed upon by the above named association and is now being taken up.

The trap is designed to catch the neck of the rabbit, an entirely new idea in trap construction. The rabbit always carries its head before its front paws, and the moment the animal places a paw upon the releasing plate a pair of scissor-like blades shoot up and catch it around the neck. Instead of a strap spring, which may become weak, a spiral wire spring is used, and



New Rabbit Trap

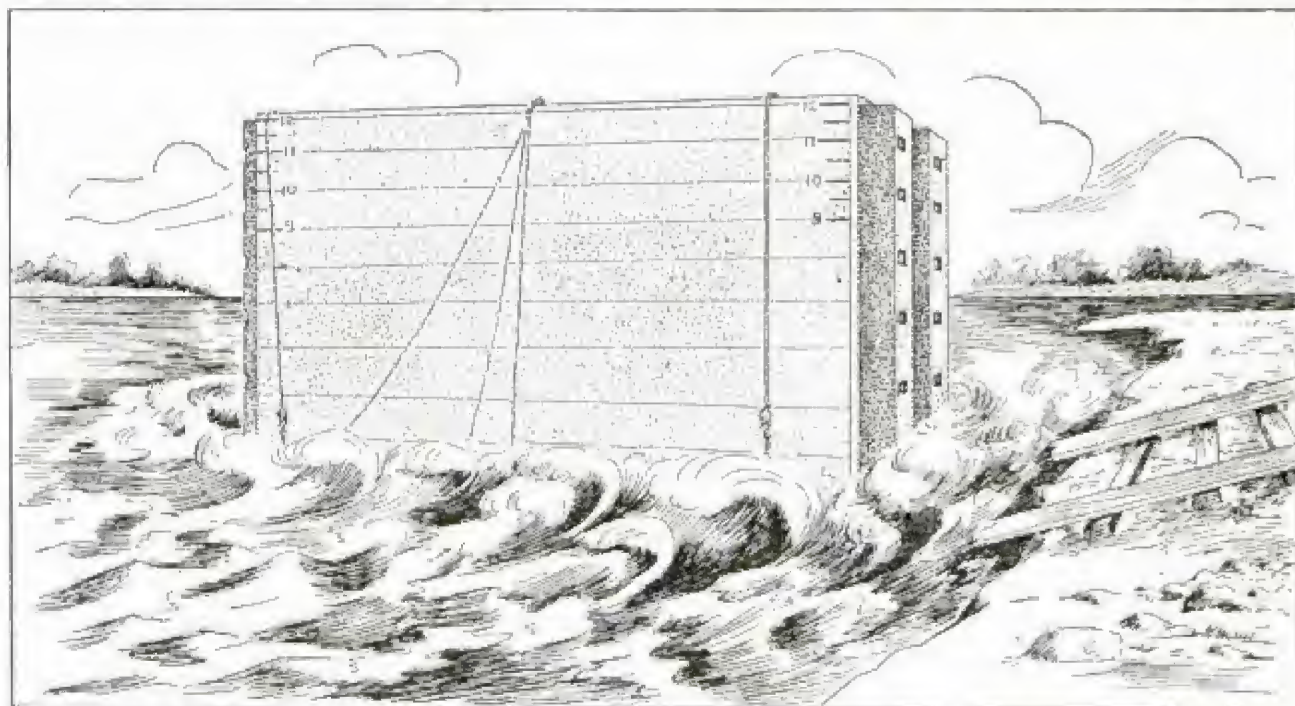
this can be replaced at any time by withdrawing a pin. The trap kills outright, and therefore needs no chain to anchor it.

FLOATING CONCRETE BLOCKS

The improvements being made on the harbor at Algoma, Wis., include a 500-ft. concrete pier, composed of mammoth concrete blocks which are launched in the same manner as a boat and floated into position. Engineers and concrete experts are watching the experiment with interest, as the idea

blocks have been towed to their position over the breakwater structure they are sunk by opening pipes that have been molded in their sides and sealed up. When afloat, about 10 ft. of the blocks are under water, so the water ballast let in through the pipes is sufficient to sink them into position. The protruding pipes are then sawed off flush with the surface of the block. If one of the blocks is found to be improperly placed when sunk, the pipes are connected with the surface, the water pumped out, and the block refloated.

After final placing, the hollow in the



Courtesy Concrete

Launching the Mammoth Concrete Block

of building a reinforced concrete block 25 ft. long by 15 ft. wide, and 12 ft. high, weighing 130 tons, and then towing it on its own bottom a distance of 12 miles, is novel, to say the least.

The concrete blocks, or caissons, as they are called, are molded at Kewau-nee, Wis., 11 miles from Algoma. Each block is rectangular in shape and is hollow, a transverse wall, like the web in a building block, making two compartments. The walls of the blocks are reinforced with steel rods from $\frac{1}{2}$ to 1 in. square. The bottom of a block is 16 in. thick, the outside walls 12 in., and the transverse wall 10 in.

The blocks are built on ways having a slope of one foot in ten, the ways extending 5 ft. under water. When the

block is filled to within 4 ft. of the top with small riprap stone. Burlap is laid over this filling, and 4 ft. of meagre concrete complete the solid block. The blocks are placed end to end on a line of piles that have been driven into the lake bottom and sawed off evenly so that the blocks rest with equal weight on each. An iron head-plate is imbedded in each pile and in the concrete block above it to insure solidity.

RAILROAD BLOCKADE

The slightest fog in America plays havoc with train schedules, and the Englishman laughs. A fall of snow in England is cause for consternation to the railroad officials of that little isle,

and the American laughs. In both instances it is a case of the unexpected and unprepared for, consequently the laugh is undeserved. The Englishman laughs because the American brand of fog would be considered as of little moment as compared with London fog, and the American laughs because snow in England would be considered only a slight fall in America.

A system of great flares beside the railroad tracks makes the running of trains in England comparatively safe in the heavy fogs that obliterate all landmarks with hardly a moment's notice.

TO RECOVER PULP WOOD FROM RIVER

An American soda pulp concern has secured the option on 500,000 cords of sunken pine piling now lying submerged in the Rideau river and the lakes near Kingston, Ont., and it proposes to raise this wood and make it into bleached soda pulp. The piling was sunk some 80 years ago, when lumbering operations along the river were just beginning, and although submerged for such a long period of time, is quite valuable.

A SCOTCH FLYING-MACHINE

Some 20 years ago a Scotch inventor devised the flying-machine now being built, as shown in this illustration. At that time aerial navigation was considered nothing more than a wild dream

of crazy inventors. It is known as a gyropter and has two umbrella-like lifters or propellers which whirl. The skeleton of the body, and framework which supports the lifters, have yet to be covered in.

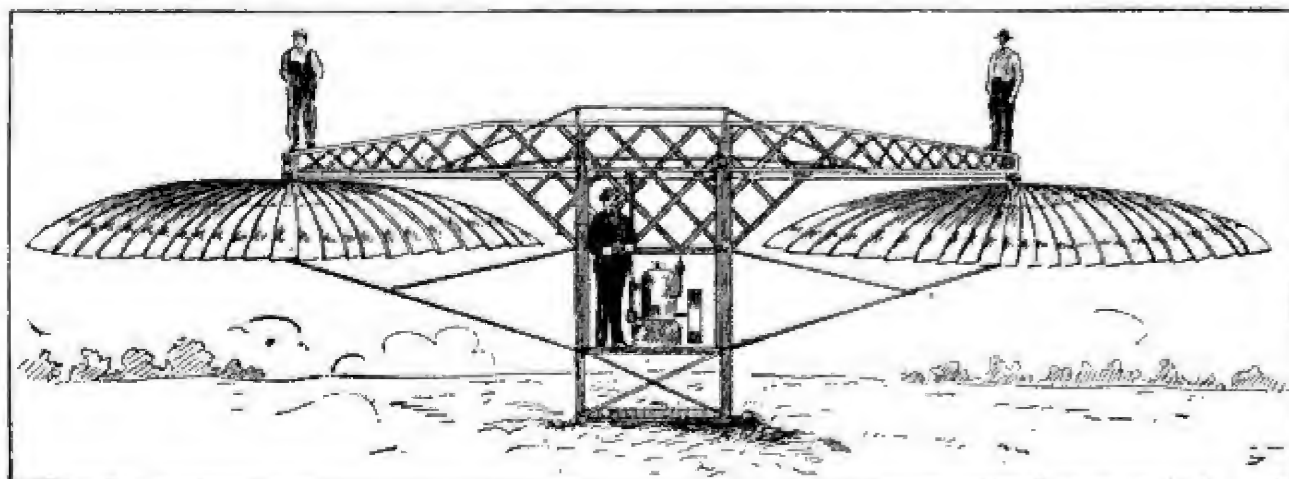
EGGS PRESERVED BY COATING WITH PARAFFIN WAX

An English firm of produce importers has adopted a new method of preserving eggs by which it is claimed that eggs six months old are made to retain their new-laid freshness. Acting on the theory that an egg decomposes because of the entrance of bacteria through the shell, the eggs are first disinfected and then immersed in a vessel of hot paraffin wax in a vacuum. The air in the shell is extracted by the vacuum, and atmospheric pressure is then allowed to enter the vessel. This presses the hot wax into the pores, thus hermetically sealing the shell and preventing the evaporation of its contents.

AN INTERESTING FILTRATION PLANT

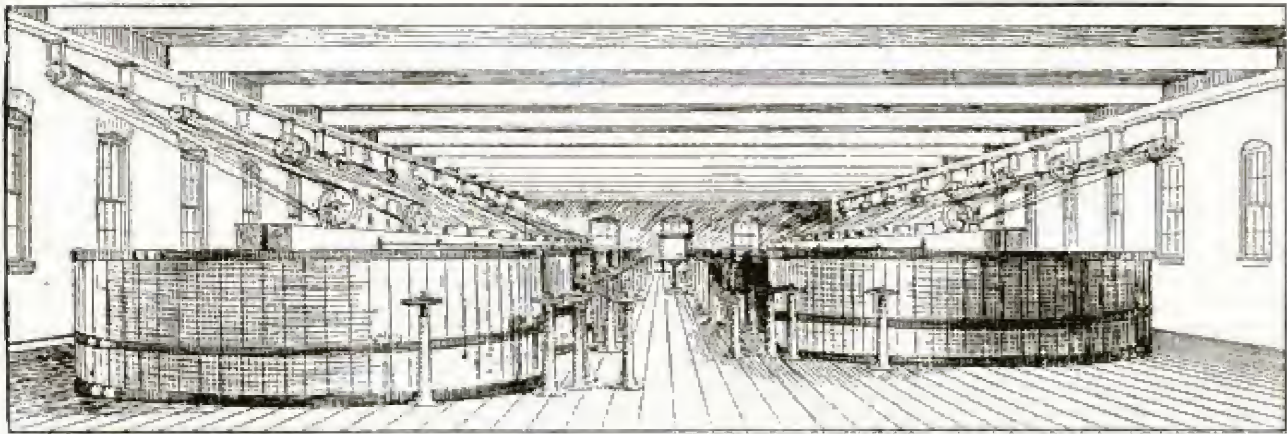
The filtration plant at Elmira, N. Y., takes its supply of water from the Chemung river, and has a capacity of 10,000,000 gal. per day. The plant has 18 filters, each of which has an effective filtering surface of 113 sq. ft., or a total area of 2,034 sq. ft.

The water filtered is treated with a solution of sulphate of alumina and



Flying-Machine Designed 20 Years Ago

Courtesy World's Work, London.



Ten Million Gallons per Day Filtered at Elmira, N. Y.

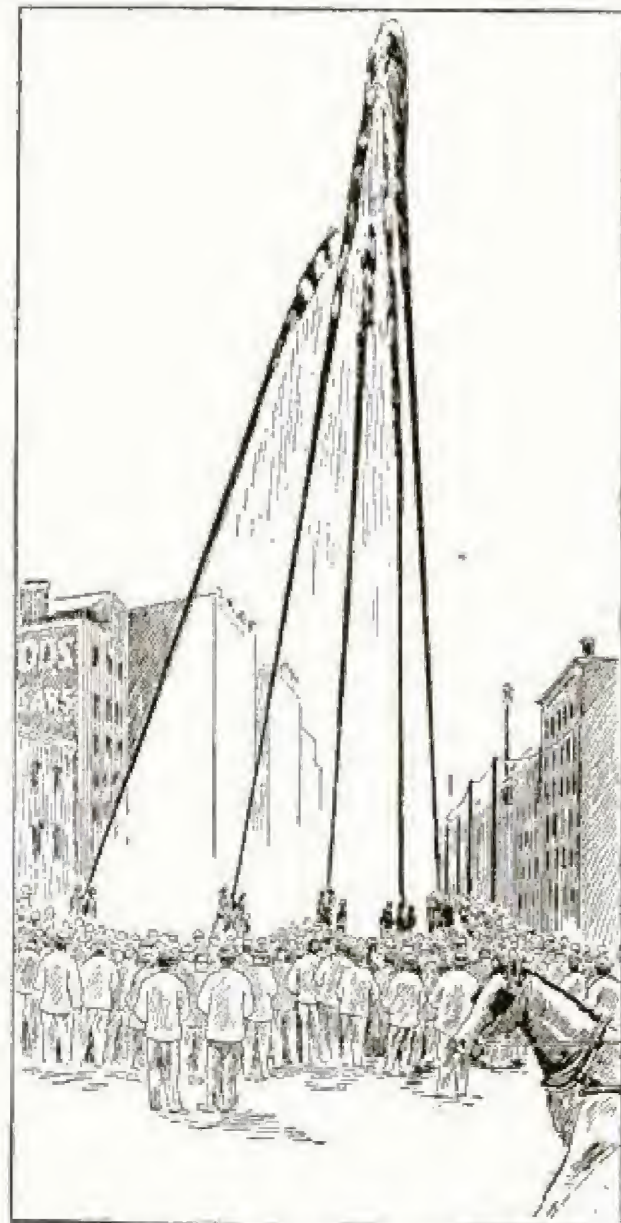
then passes into the subsidence basins, where it remains about 30 minutes. In these basins the sulphate of alumina separates itself from the water into cloud-like masses. After the water has partially settled it passes to the top of the filter, the remaining particles of matter being caught and held back by the coagulated material, which is heavier than water and does not rise. Therefore when the water reaches the top of the filters it contains little or no sediment. At the top of the filters are beds of sand 43 in. in depth, and when the water has filtered through this it is discharged into a flume, which conducts it to the reservoir. The sand used is nearly pure silica, obtained from Red Wing, Minn. The filtered water is analyzed every day and shows an average of purity of 99 per cent.

NEW YORK'S HIGH-PRESSURE SYSTEM UNDER A CLOUD

During a recent fire in New York which destroyed a 6-story loft and manufacturing building, entailing a loss of \$100,000, the much vaunted high-pressure fire system failed completely, which led Chief Croker to make the sensational statement that if the new system, which cost the city millions of dollars, continued to fail, the authorities would have to return to the old methods.

The failure which brought forth this statement from Chief Croker is the second serious one to be reported, but many claim that the system is not alto-

gether at fault. After the delay occasioned by the break in the high-pressure pipes had been overcome, seven sections of the hose burst, which seems to denote that the New York fire department has not thoroughly learned the lesson imparted by its experience with rotten hose last winter



Testing the High Pressure

The failures that have occurred are, according to some authorities, apt to be experienced again, making it plain



Correct Way of Changing Seats in a Row-Boat

Incorrect and Dangerous



The Result



Incorrect Way of re-entering all on one side



Correct Way of re-entering, over stern

that the day of big fires in the territory covered by the system is not a thing of the past. The high-pressure pipes have not yet thoroughly proven that they can withstand the pressure which the service requires, and more breaks may be looked for until all the weak spots have been located. The salt water pumped through the high-pressure system, while an excellent extinguisher, does more damage to goods than fresh water.

ROWBOAT ACCIDENTS

Every man, woman, and child who uses a rowboat every day or only once a year should know and heed the "don'ts" that change rowboating from a positively dangerous pastime to a comparatively safe one. This set of illustrations shows the correct and incorrect way of changing seats in a rowboat, and the correct and incorrect way of attempting to get back into a boat if an accident should spill its occupants out. When "don't rock the boat" is added to these simple rules, and heeded, safety is assured under ordinary circumstances.

A NEW ARTIFICIAL PAVING STONE

The officials of the leading German cities are experimenting with a new artificial paving stone called "vulcanol." It is a mixture of crushed basalt or similar rock with a small percentage of cement. The material is made into blocks by hydraulic pressure, burned about 12 days in a special furnace, and cooled slowly. The blocks are laid on a concrete or macadam base. It is claimed that these pavements are comparatively cheap, tough, and durable.

Thin sheets of the same material are used for sidewalks.

"When my brother and I set out on this game," says Wilbur Wright, "we did not think it would be possible for a man to fly within 50 years."

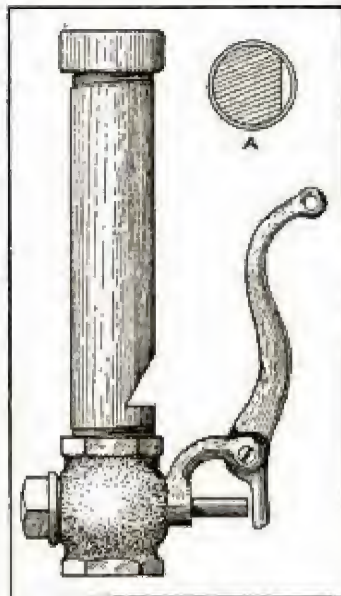


SHOP NOTES



Home-Made Steam Whistle

The accompanying sketch shows the construction of a cheap steam whistle.

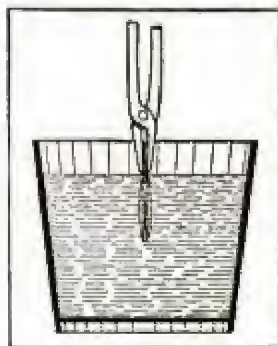


The main body of the whistle is made from a $\frac{3}{4}$ -in. pipe 8 in. long, says Power. Cut a thread on both ends, put a cap on the end intended for the top and fit a plug in the other end. This plug must have a small portion of its side filed out as shown at A in

the sketch. A notch is cut in the side of the pipe with its horizontal edge level with the top of the plug. The pipe is then screwed into a whistle valve. Tones to suit can be made by using either a larger or shorter pipe.

How to Temper a Pocket Knife

Use a pair of tongs that has flat, straight jaws and heat them to a good red. When heated pinch the blade of the knife in the jaws with the handle hanging straight down, and immerse the handle of the knife in water, as shown in the sketch.

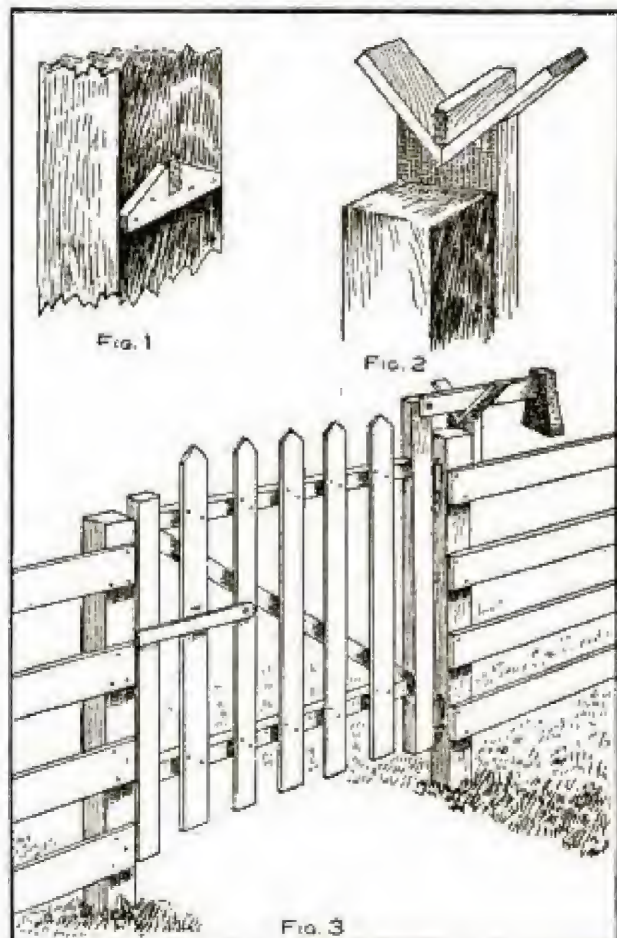


The water will keep the heat of the tongs from spoiling the handle. The blade will soon be heated red from the tongs. When the proper heat is secured in the blade take hold of the knife by the handle and release the tongs. Immediately plunge the

blade of the knife into a bar of soap. This will give it a nice temper. If plunged into water or oil the thin edge is liable to crack.—Contributed by Raymond Gregg, Hammond, Ind.

Double-Swing Self-Closing Gate

A gate that is easily pushed open from either side and self-closing can



The Gate Swings Both Ways

be made from a common gate by using hinges that will swing both ways, a special latch and weight closing device. The catch for the latch is made from a strip of board 6 in. long with a notch cut in the center of one edge. Both sides from the notch are cut sloping and the piece nailed to the gate side of the post as shown in Fig. 1. The crotch for the self-closing device is shown in Fig. 2. This consists of a

block of wood with a notch sawed in one end and two boards fitted in the notch and nailed solid. The block is nailed to the back side of the post on which the gate swings. A piece of wood about 9 in. long is fastened at one end to the rear post of the gate with a large wood screw or small bolt. The other end of this piece is fitted with a weight to draw the gate closed when the piece slides down either one of the sloping boards of the crotch.—Contributed by Henry W. Beaver, Havana, Cuba.

The Proper Direction for a Stationary Engine to Run

By George W. Richardson

Nearly all stationary engines are installed and connected up to the work so they will "run over," right-hand or clock-wise in order to have the slack belt running on top. Much more circumference of each pulley will be covered by the belt if it is allowed to have the sag on top. This will give more adhesive surface to each pulley. This is not the real reason that most engines are set to "run over" or right-handed.

Horizontal engines that are not of

special design have the weakest part of the girder frame on the top guide for the crosshead. In Fig. 1 is shown an engine that is set to run under, the forces acting alternately on the piston cause the connecting-rod to give an upward thrust on the crosshead against the top guides in the direction shown by the arrow. In Fig. 2 is shown an engine set to run over, the thrust of the connecting-rod being downward on the crosshead and against the bottom guards, as indicated by the direction of the arrow. The top guide is not as rigid as the one on the bottom, which makes it advisable to have the engine run over and give the thrust downward on the engine bed and foundation.

How to Make Up a Solution

In the following manner a salt may be brought into solution almost as quickly as by constant agitation and with much less work and trouble, says Practical Druggist. Place the substance and the solvent together in a bottle, cork it, and then invert the bottle so that the portion that remains undissolved will settle in the neck and shoulder. Then lay the bottle on its

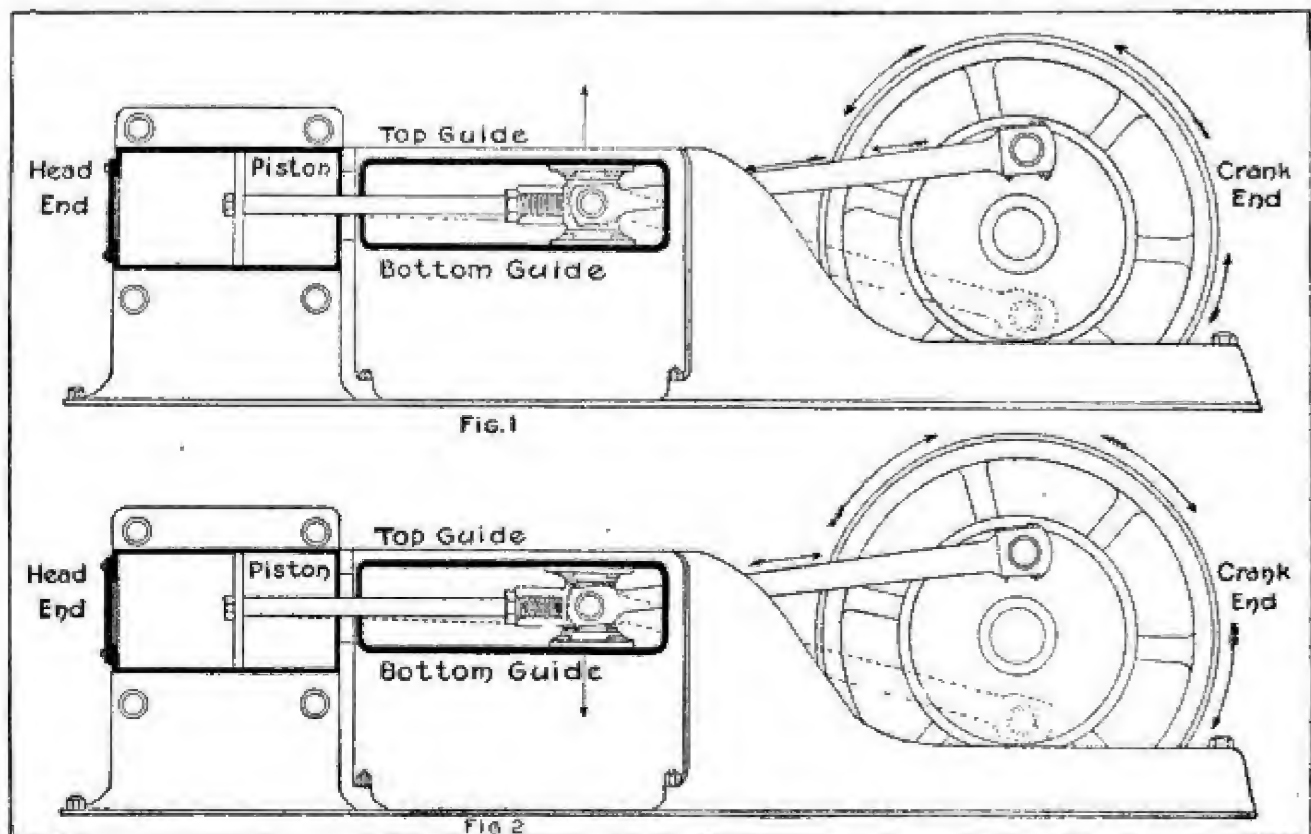


Diagram Showing the Proper Way to Run an Engine

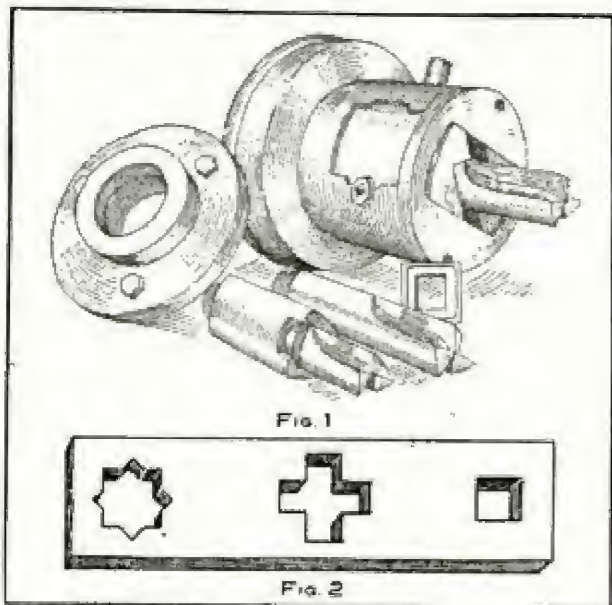
side with the neck elevated so as to incline it slightly and yet leave the salt in the upper end. The solution will be completed in a short time by circulatory displacement.

A Tool for Drilling Square Holes

A three-cornered drill that bores square holes and that can be used on any lathe, drill press or milling machine is one of the latest improvements in mechanical tools. This tool will have a wide field of application in wood, stone and metal working materials. The time occupied by usual methods of cutting square or angular holes is so great as to bar their use except on expensive work, but when using the new drill a square hole can be bored nearly as rapidly as boring a round hole with a twist drill.

With a little change of the drill, triangular holes, and holes with five, six or more sides can be bored as desired. The device for doing this work consists of a special drill, three-cornered for making square holes, and a special chuck for holding this tool which is fixed on the ordinary lathe or drill press. This chuck contains three parts that move independently of one another. First, a part that screws on and revolves with the spindle of a lathe or drill; second, a stationary part which rides on the first part, and third, a holder into which the shank of the drill is screwed. This holder is caused to rotate with the first part, but is at liberty to move side-wise a certain distance in any direction. The exact motion is determined by a guide in the second part of the chuck which surrounds the shank of the drill.

The shank of the drill is three-cornered, but not exactly triangular—that is, the three sides are convex, being formed by arcs of circles struck from centers at the opposite corners. The three-cornered shank just fits into the square guide and as the shank turns around in the guide which is held stationary the three corners of the shank in turn enter into each of the four corners of the guide. At the same time



Chuck and Drill for Boring Square Holes

the three corners of the cutting head strike out the sides of the work. The cutting edges are on the end of the tool. The drills and chuck are shown in Fig. 1 and some holes that can be bored with the tool are shown in Fig. 2.

Gasoline can be used as a soldering flux for very neat work on tin. Follow up quickly with a hot copper and no stain will show.

Removing a Reamer from a Barrel

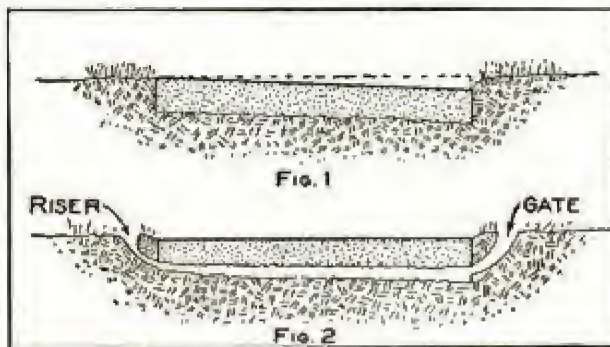
While reaming out a hole in a barrel the reamer slipped through on the inside. Several methods were applied to extract the reamer from the barrel, with failure. At last the simple device shown in the illustration was used with success. The device consisted of a $\frac{3}{4}$ -in. gaspipe of the proper length and a piece of steel wire. The wire was bent in the middle and inserted through the gaspipe. The ends of the wire were bent in the shape shown, and by moving the wire up and down through the pipe the jaws of the wire will open and close.—Harry L. Miles, Winnipeg, Man.



For Removing Tools from a Barrel

How to Level an Old Stone Walk

A walk made from large cut stones, each about 4 by 6 ft. in size, had been in use for a good many years. This walk was situated between a shop and the storehouse and used for trucking materials from one building to the other. The stone slabs had settled irregularly and hardly any of them were



Raising an Old Stone Sidewalk

level, which made the trucking very difficult. On account of the walk being laid so many years the supposition was that the earth beneath the stone was as solid as could be made and plans were decided on to raise the stone blocks to the proper level and fill the open space with concrete.

Fig. 1 shows how the stones were sunk below the level and to one side. In Fig. 2 is shown the stone raised to the proper level and then blocked to keep it in this position until the concrete was put in and time given for the mixture to set. Two pouring gates were made on the side of each stone that had been low and three risers cut on the opposite side. A very wet mixture of sand and cement was then poured in at both gates until the mixture showed well in all the risers. Plenty of time was given for the cement to set and the job was very satisfactory.—Contributed by W. E. Morey, Chicago, Ill.

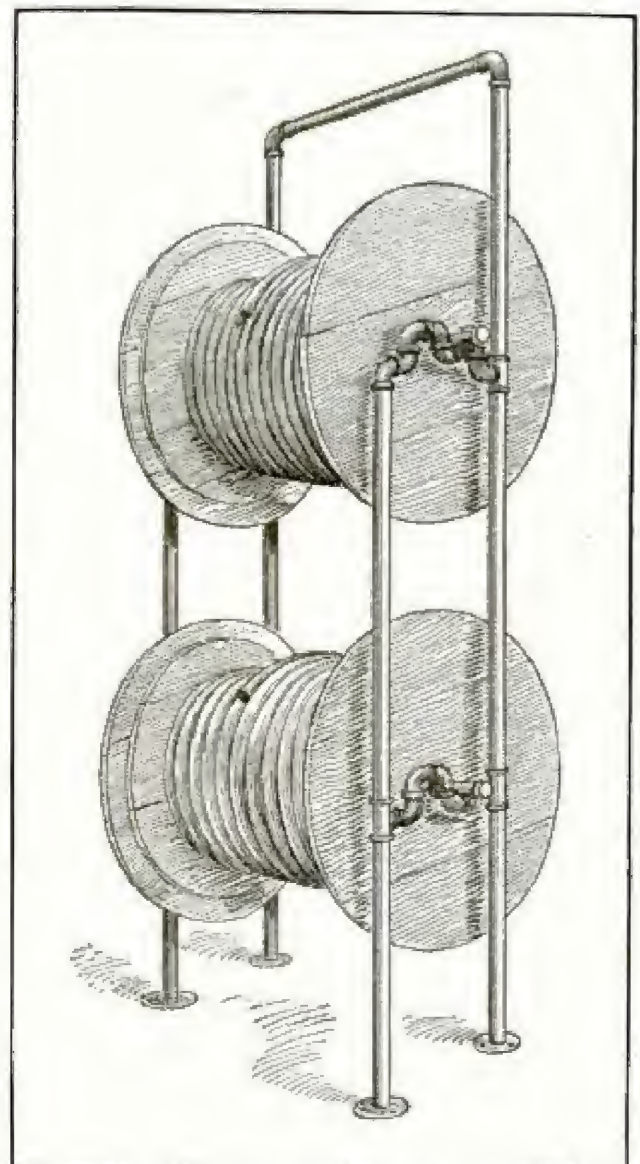
Making Weak Piston Rings Effective

The owner of a small boat had in the boat a two-cycle 2-hp. gasoline engine that when new was very powerful

and developed full $2\frac{1}{2}$ hp., but during the latter part of the first season it did not do so well and the compression was very bad. When the piston was removed it was found that the two upper rings were badly stuck. These rings were removed and filed down so they would fit loosely, but before replacing them, three pieces of clock spring about the width of the groove and $1\frac{1}{4}$ in. long and of a shape just opposite to the shape of the piston were inserted in the groove. These pieces had a tendency to spring the rings out, says Gas Power. The result obtained made the compression 50 per cent better.

Home-Made Reel Rack for Lead Pipe

The accompanying sketch shows a novel lead pipe reel rack to be used in



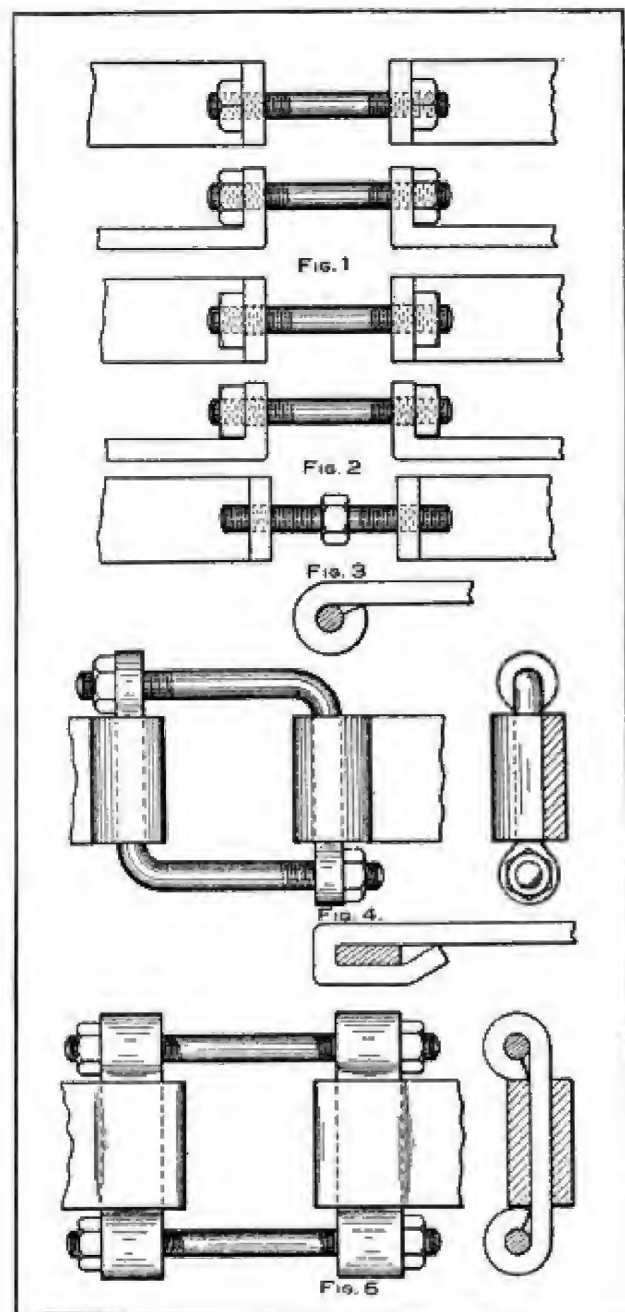
Lead Pipe Coiled on Large Spools

a store for handling lead pipe. The frame is made from ordinary black pipe and fittings. The first lengths of pipe beginning at the floor are 15 in. long and these are held at their lower ends with malleable floor plates. The vertical pipes are reduced from the first set of tees to the second set to 1-in. pipe which are 2 ft. 8 in. long. These have right and left threads so they can be turned into place without using unions. The axle supports are made of malleable elbows, street elbows and cross-overs. The axles are $\frac{3}{4}$ -in. pipe, each 3 ft. long, with lock nuts near the extremities and $\frac{3}{4}$ -in. malleable caps on each end. The pipes and fittings above the upper axle bearing are 1 in.

Hoop Tighteners for Wooden Tanks

Where wrought-iron hoops are used on wooden tanks, brick kilns and blast furnaces some means for adjustment, or method of tightening each hoop, is necessary. Wedges, which sometimes are used, are not satisfactory, as they often slip or fall out. In Fig. 1 is shown a common method of tightening up a narrow hoop. A double-threaded bolt is passed through the upturned ends of the hoop and the adjustment made by using a common wrench on hexagonal nuts supplied to each end. Another method is shown in Fig. 2 in which square nuts are used on a bolt having right and left-hand threads. The adjustment is made by means of a pipe wrench taking hold on the shank or body of the bolt. The holes in the upturned ends of the hoop must be in such location that the nuts will not turn. In Fig. 3 is shown a similar arrangement. The nuts are omitted, however, and the right and left-hand threads cut in the upturned ends of the hoop. The body of the bolt is furnished with a hexagonal head for turning with a wrench. These three examples are for narrow hoops, although the same methods can be carried out with wider hoops by using two or more bolts.

An arrangement, as shown in Fig.

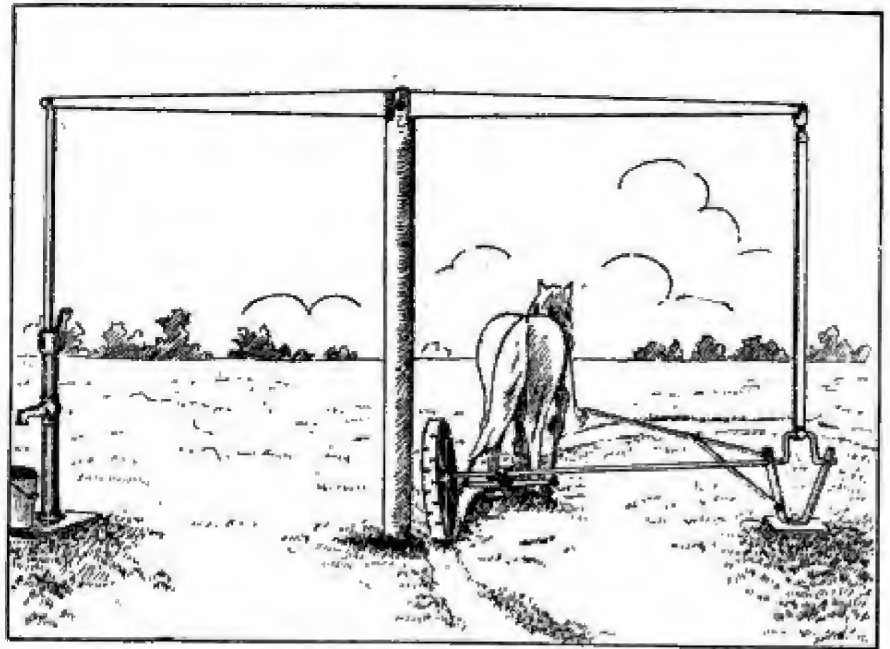


Different Forms of Hoop Tighteners for Narrow and Wide Bands

4, can be successfully used for wider hoops. This device consists of a long eyebolt bent at right angles after it is passed through the forged eye of the hoop, and then passed through the eye of the second bolt and treated in a similar manner. A long thread is cut on the bolts and fitted with hexagonal nuts for adjustment of the hoops. Another method for use with wide hoops is shown in Fig. 5. This method consists of two bars fitted with eyes at each end and fastened to the ends of the hoop by a bend in the latter. Two long bolts with sufficient threads are fitted with hexagonal nuts for adjustment with an ordinary wrench.

Home-Made Horse Power Pump

The accompanying sketch shows a novel horse power pump which is used on a ranch in Oregon. This pump consists of a walking beam 20 to 25 ft. long which is connected at one end to the pump rod and at the other end to the shaft of an old mower wheel. This shaft is lengthened out to about 12 ft. and bent into the shape of a crank near the end opposite the wheel. The bearings for this crank are made from a piece of bar iron V-shaped with a flat bottom. This iron is bolted down loosely to a piece of timber fitted into the ground. The horse is hitched on near the wheel. The V-shaped bearing turns as the horse walks around in a circle and the crank makes a double stroke for every revolution of the mower wheel. Where a well is deep two mower wheels may be put together to add tractive weight. A horse soon learns to operate this pump without a driver.—Contributed by F. M. Priest, Bonanza, Oregon.

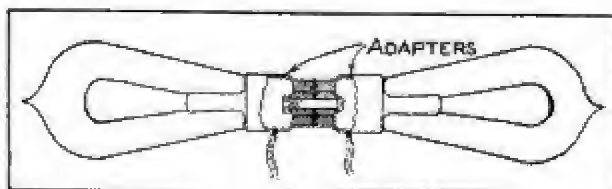


The Horse Pumps the Water

connected between them to the stove bolt, you will have a 110-volt test outfit from one lamp. Having the middle wire a different color will avoid mistakes.—Contributed by B. R. Browne, Philadelphia, Pa.

How to Make a Small Electric Testing Set

A small testing set that will take up very little space in an electrician's kit can be made from two lamp-socket adapters. The two adapters are insulated from each other with a fiber or mica washer and all three parts held together with a stove bolt. Solder the flexible wire to the shells of the adapters and cover entirely over with tape.



A Small Test Outfit

Muffle and Electric Furnace Temperatures

In a muffle furnace the temperature in the center is lower than near the walls. This fact caused a peculiar error in a factory which formerly used muffle furnaces and then introduced the electric furnace, says Mining Science. In the muffle furnace the temperature for hardening the different kinds of steels had been carefully determined in the central zone of the furnace. When the same temperature was then produced in the electric furnace it was found to be insufficient for hardening. The reason was that the former temperature determinations in the muffle furnace had been made in the center, while the steel parts to be hardened (teeth, edges, etc.) were near the walls. Since near the walls of the furnace the temperature was higher than that meas-

ured in the center of the furnace, the measured temperature did not give the correct hardening temperature. For the electric furnace, with its absolutely uniform temperature, a higher temperature had therefore to be employed than existed in the center of the muffle furnace.

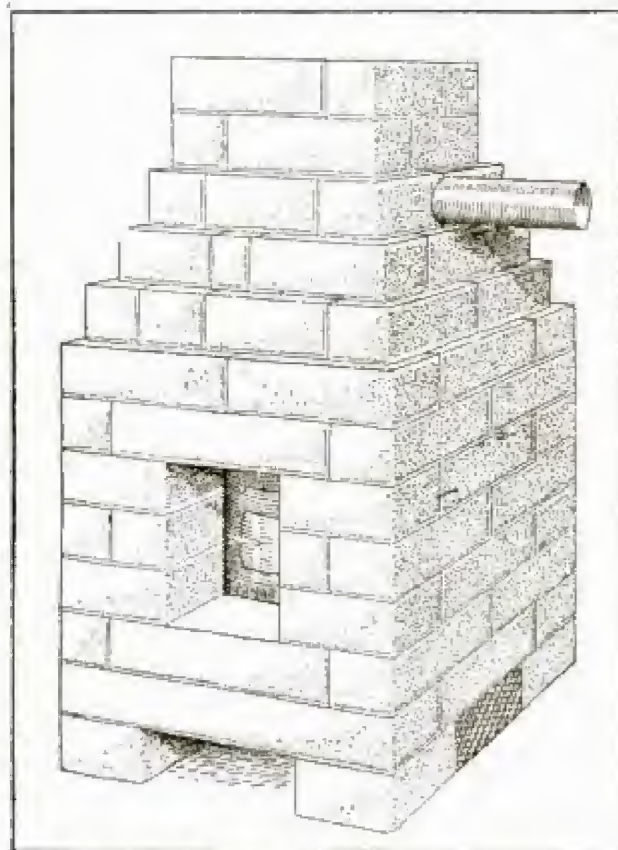
How to Build a Concrete Block Furnace

[Condensed from Concrete]

As shown in the illustration, the main portion of the furnace is a large heating stove of the kind known as the "cannon ball" or shop stove, or may be any heating stove of the same design or method of construction. In this grade of stove the sides are from $\frac{3}{4}$ to 1 in. thick, making a stove that for furnace purposes is ideal. There is no danger of its "burning out," and this thickness of iron when once thoroughly heated remains hot for a long period with only a moderate fire in the stove.

The stove is first set into place in the cellar under the central room of the house on a concrete floor made of sufficient strength to avoid any danger of the concrete jacket settling and cracking. The jacket is laid up with concrete blocks as illustrated, a space being left in the bottom course through which the ash-pan may be taken out, also for cold air registers on the three other sides of the jacket. The latter should be at least 6 by 8 in. in size and may be laid up with the walls of the jacket and securely fastened in place with the mortar. Above the ash-pan a beam of concrete is placed. This should be molded of twice the length of two of the blocks used, so as to bridge the space rightly. In the fourth course of blocks an opening is left sufficient to allow the draft and feed door in the front of the stove to be opened. The space between the stove and the wall of the jacket where this opening is located is filled with cement so as to prevent the heat escaping into the cellar, except such as is thrown out from the feed door.

With the seventh course of blocks



Furnace Made of Concrete Blocks

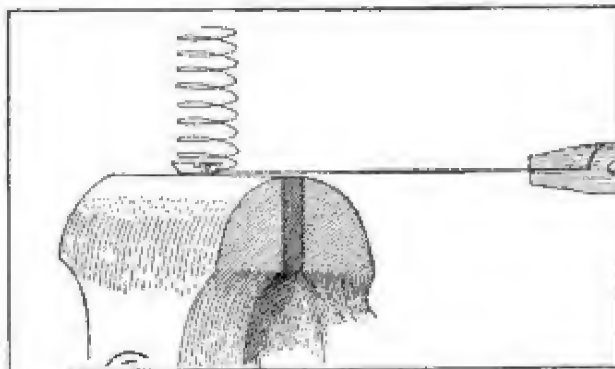
another beam is used to bridge the space above the feed door opening and the space between this and the stove cemented together, unless it is desired to have a door to close the feed door opening on the outside of the jacket. In this case the space between beam and stove is left open so that the heat may be utilized. With the ninth course of blocks, begin to draw in for the arch on all four sides until the inside space is 14 by 20 in. Then the jacket is laid up until it reaches the floor above, in which a hole is cut and a 14 by 20 in. register is placed.

Place a heavy elbow on the opening for the stove pipe and use a heavy pipe to carry the burnt gases outside the jacket in one course of the blocks. The opening around the pipe is easily filled with mortar so as to be airtight. This furnace has ample radiation for heating a 10-room dwelling, or a store or factory of the same floor space.

Norway iron usually contains 99.8 per cent of iron, the remainder being sulphur, carbon, phosphorus, silicon, slag and manganese. The purity of this iron is obtained by using very pure ores and by smelting with charcoal.

Uncoiling Springs

Sometimes when making springs from piano wire considerable amount of wire is used before producing the required result. Instead of throwing away the useless spring, clamp an ordinary wood screw in a vise as shown



Pulling the Coil Out Straight

in the sketch, put the useless spring on the screw head and pull out the wire until the spring is uncoiled, using care that the spring does not fly off and strike you when nearing the end.—Contributed by Arthur W. Andrews, Birmingham, England.

How to Build a Prairie Schooner Barn

The barn as illustrated is built on the plan of a prairie schooner, as it is mostly roof and has no beam or mortise in its make-up, and ordinary farm help can do all of the work, says a correspondent of Rural New-Yorker. The barn is 40 ft. long and 60 ft. wide; the arches, which represent the bows of a prairie schooner or mover's wagon, are made of 1-in. boards 6 in. wide, and

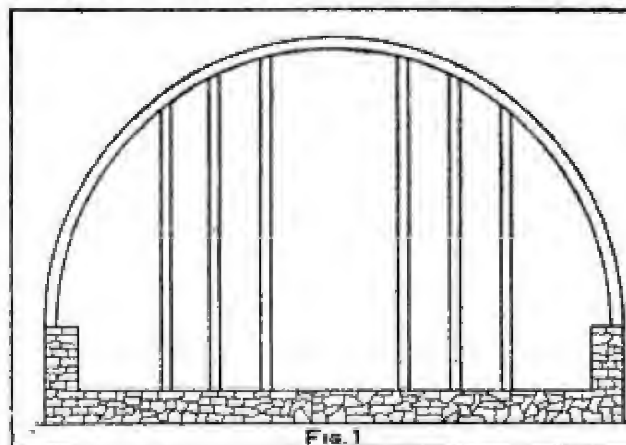


Fig. 1

six boards deep. The boards can be of any length or various lengths. Each board is bent to shape as it is nailed to the others, using plenty of nails and giving a good lap over each joint.

The half-circle arches are made in a form constructed of posts set a few feet apart in the ground and to the outside of a half circle line drawn with the proper radius. The posts should be set perpendicular and extend three or more feet out of the ground to make room for several arches to be made at one time. The arches were placed about 3 ft. apart on the side walls, which were built of stone 4 ft. high and 2 ft. thick. The arches or rafters were covered with sheathing and shingles, except the top, which was too flat for shingles, and metal roofing was used. Six round posts were used in each end, extending from the top of a stone wall 1 ft. high to the arches. The girders and siding were nailed to these posts.

The floor is paved with field stone about 12 in. deep, except in the stalls, which were filled with sand 8 in. deep and covered with wooden blocks 4 in. long set on end. The stone was covered smooth with hard clay.

Polish for Cleaning and Preserving Furniture

Splashes of dirt on polished furniture are removed with soap and water, and the wood is well rubbed with a mixture of equal parts of spirit and oil or spirit and turpentine, applied with a woolen rag. This mixture has both a cleansing and polishing action, the pol-

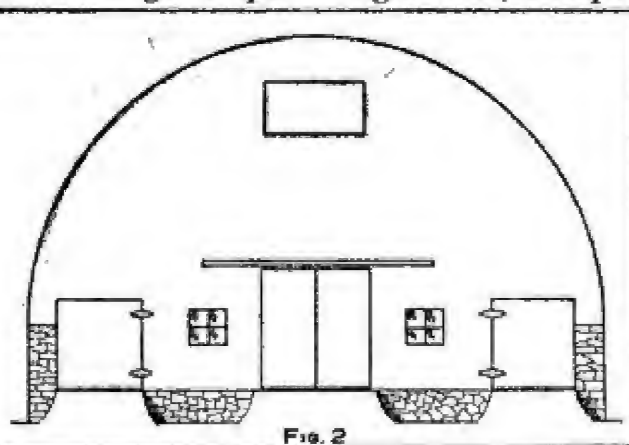


Fig. 2

The Roof Represents a Half Circle

ish being retained for a long time if well rubbed in and the surplus wiped off.

Another good preparation for the purpose is a solution of stearine in oil of turpentine and a little spirit, care being taken not to use so much stearine that white streaks are produced in the mass, says the Master Painter. When the turpentine and spirit have evaporated the wood is well rubbed with a woolen rag. This gives an excellent polish that can be renewed by rubbing when dimmed.

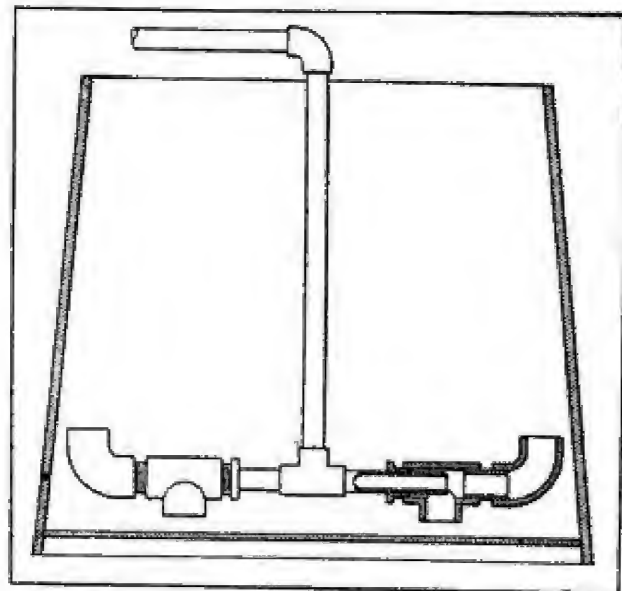
Furniture with a matt finish can be renovated with a thin solution of white in oil of turpentine, or by rubbing it over with linseed oil.

How to Drive Out Bolts

Bolts are very often spoiled in driving them out from the parts in which they are located. If they do not start readily one is often tempted to use the hammer upon them, with the result that the ends of the threads are frequently burred over. A stick of hard wood, or still better, vulcanized fibre, used between the hammer and the bolt end will prevent damage of this kind, says the Blacksmith and Wheelwright. When neither is available, the nut may in some cases be run out flush with the end of the bolt, or even a little beyond the end, and a blow carefully placed upon the nut so as not to spoil the threads will probably start the bolt.

Stopping Noise When Heating Water by Steam

When steam at 70 or 80 lb. pressure is turned into a tank of cold water for heating there will be a very disagreeable noise. A certain plant using a large quantity of hot water had to heat their water with steam, and to eliminate the noise they constructed a device as shown in the sketch. As a siphon ejector will make no noise of any consequence, this principle was applied, says Practical Engineer. The $\frac{3}{8}$ -in. main



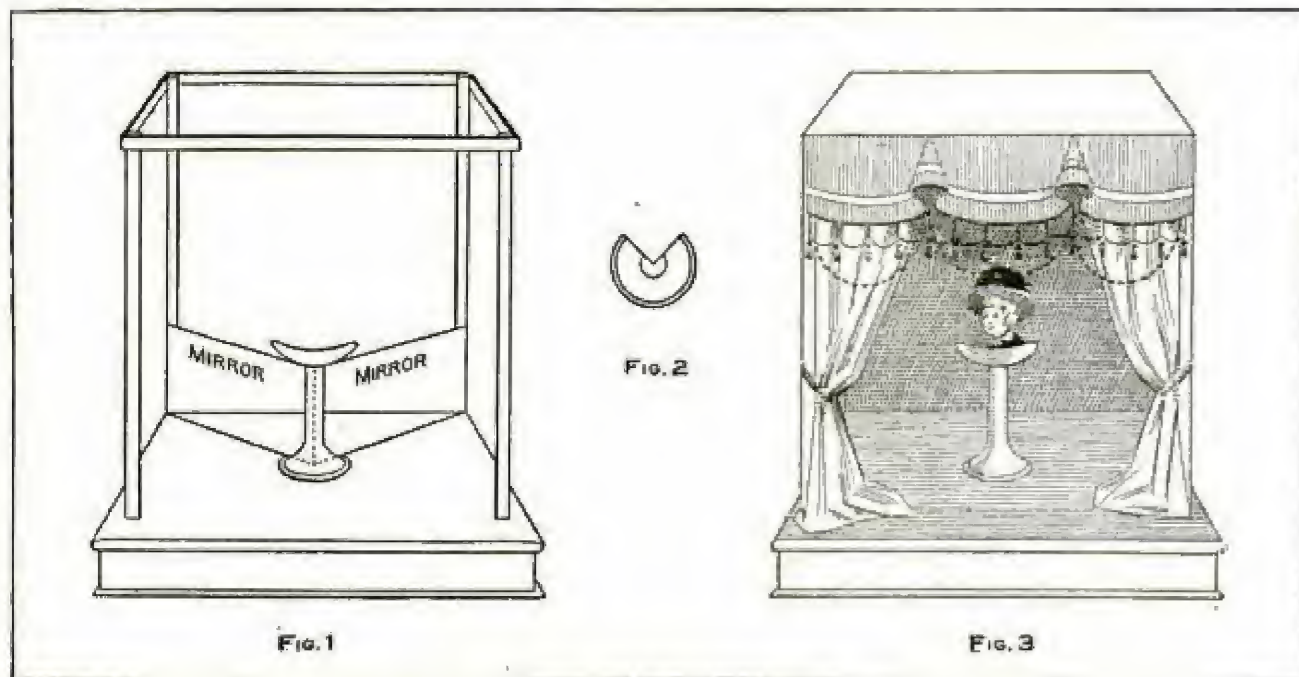
Noiseless Steam Water Heater

pipe carrying the steam into the tank was fitted with a tee on the bottom end, and into this tee two nipples were fitted with long threads on the outer ends. These ends were fitted with two $\frac{3}{8}$ - by $1\frac{1}{4}$ -in. bushings, allowing the ends to extend through them. On these bushings were screwed two $1\frac{1}{4}$ -in. tees with a short nipple and an elbow as shown in the sketch.

When the steam is passing in a jet at the end of the small pipe in the large tee, the water will be drawn up from the bottom of the tank and upward at the sides through the ell and return to the bottom of the tank again down the center, causing a continuous circulation until the water reaches the boiling point. The noise made by the appliance when at work is no more than that made by an ordinary-sized injector or a siphon ejector.

Improving Cheap Lead Pencils

Soak an ordinary cheap lead pencil in linseed oil and its writing qualities will be improved, the sharpening made easy and the lead will wear better. Use boiled linseed oil and add a few drops of perfume. Immerse the pencils for three-quarters of their length vertically in the oil for 3 or 4 days. Remove them, wipe off the surplus oil and wash in benzine.—Contributed by Chas. P. Fox, Akron, O.



A SHOW WINDOW ILLUSION

A new idea in window displays which could doubtless be used as a novelty is described in the Merchants' Record and Show Window. The construction is very simple and the illustration will show the proper setting for the display. The platform is first constructed, which should be about 12 in. high. On this platform make a frame of light lumber, as shown in Fig. 1. Over the two sides and back of this frame is draped goods of some solid dark color such as deep green. In the middle is placed a pedestal, which is cut out along its entire length as shown in Fig. 2. The top is made of a large wooden bowl having a section of the back cut out to admit the form of a young woman, making it appear as if the bowl were filled.

The placing of the mirrors is shown in Fig. 1. They fit into the groove in the pedestal and extend diagonally back to the two rear corners. When the mirrors are properly fitted they will reflect the two sides of the booth. To the spectator in front it seems that he is looking at the back of the booth instead of the reflections of the sides. The appearance to him is that he can see all around the pedestal. The person demonstrating stands back of the mirrors and close up against the pedestal and bowl. Only the head and shoulders

should be visible, which will appear to rest in the bowl.

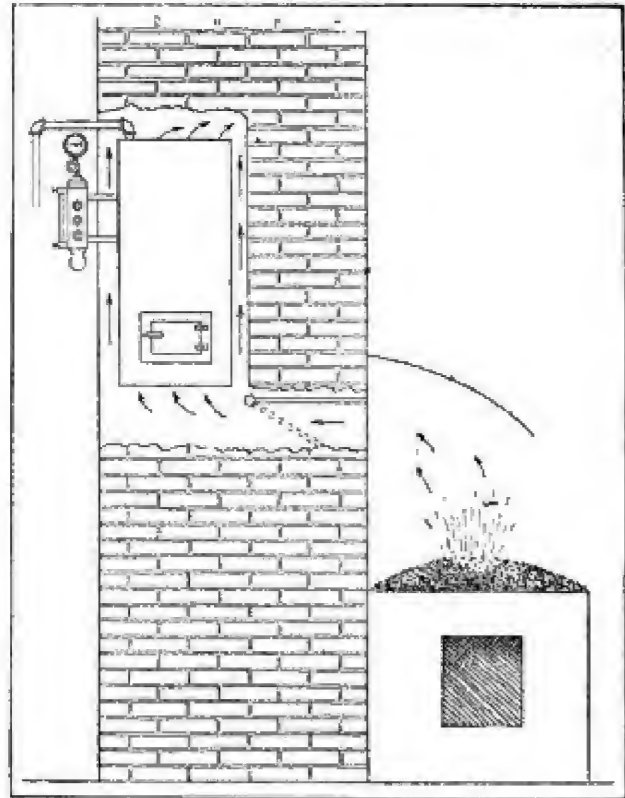
The illustration, Fig. 3, shows a display made for millinery. In this case a young woman stood behind the pedestal with a hat of one style and by having several hats lying back of the mirrors she could disappear, make a change of headgear and reappear to the mystification of the crowd in front of the window. The remainder of the show window can be made to harmonize with the covering of the booth. The illusion scheme is a good one to use on special occasions, such as during carnivals or street fairs. Its success depends upon the careful fitting of the mirrors and the manner in which the curtains are arranged. The inside of the booth should be comparatively dark and the curtains should hang straight, otherwise the scheme may be detected.

Waterproofing Shoe Leather

The leather of shoes may be rendered waterproof by first applying a mixture of 1 part ozokerite, 2 parts castor oil and enough lampblack to color, if black is desired, says Practical Druggist. The second application is a mixture of 4 parts suet, 16 parts olive oil, 1 part wax and 1 part spermaceti.

Things to Know About the Power Hack-Saw

The most important thing to remember when running a power hack-saw is to keep the saw tight in the frame. More saws will be broken by being loose than from any other cause. When sawing tubing or pipe use a fine-toothed saw and give a good feed. A square end can be made on a rectangular piece of metal by first sawing about $\frac{1}{4}$ inch deep on one side, then turn the piece and start the saw on the cut. The saw will follow the cut and make a square end. Steel or wrought iron require a slower feed than brass or cast iron. Too much feed will clog the saw and cause it to break.—Contributed by Donald A. Hampson, Middletown, N. Y.



Utilizing Heat from the Forge

Heat from a Forge Used for Generating Steam

In large forge works, boilers are located over the furnaces and the waste heat passing through the flues generates steam to drive the steam hammers. A correspondent of the American Blacksmith has made use of this idea to utilize the waste heat from his forge. An 18- by 36-in. tubular boiler was hung in the brickwork so that there could not be much loss of heat, and located just back of the forge chimney. The heat from the forge fire passes up through the fire box of the boiler, through the flues and around the outside of the boiler. The heat then enters the chimney at the top of the boiler.

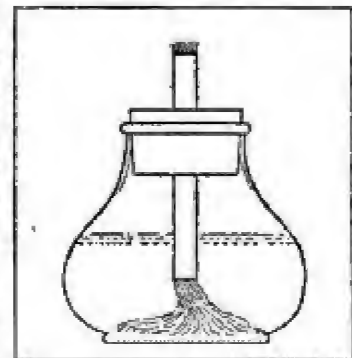
The gauge cocks and the glass water gauge are on the back side of the boiler housing, in easy reach of the blacksmith from a platform a little below the bottom of the boiler. A swing damper, located as shown, controls the heat from the forge fire. This damper can be dropped down when the boiler is not in use, thus sending the heat up the flue of the chimney. The damper is made of thick sheet iron riveted to a piece of $\frac{1}{2}$ -in. round iron bent to form a lever for a weight to slide upon so

the damper can be held in any position wanted. A great deal of heat can be saved and used to generate steam for heating the shop.

Wherever possible use green sand cores in making aluminum castings, as they yield better than the dry sand ones and prevent cracks in the castings.

Home-Made Alcohol Lamp

Wash and clean an old mucilage bottle and make a tube from the brush handle by cutting a small portion from each end. Run some cotton wick through the tube. Take a cork that will fit the bottle and make a hole in the center in which to insert the tube with the wick. A cartridge shell or some such cover should be fitted over the upper end of the tube to prevent evaporation. Fill the bottle with alcohol and you will have a good lamp for doing small or jeweler's work.



Care of Crucibles

With proper care, the life of the average crucible used in brass foundries can be greatly lengthened. A new, cold crucible should never be placed in the furnace immediately after it has been received. It should be stored in a dry, warm place for at least two weeks before it is used, the top of the core oven being ideal for storage purposes.

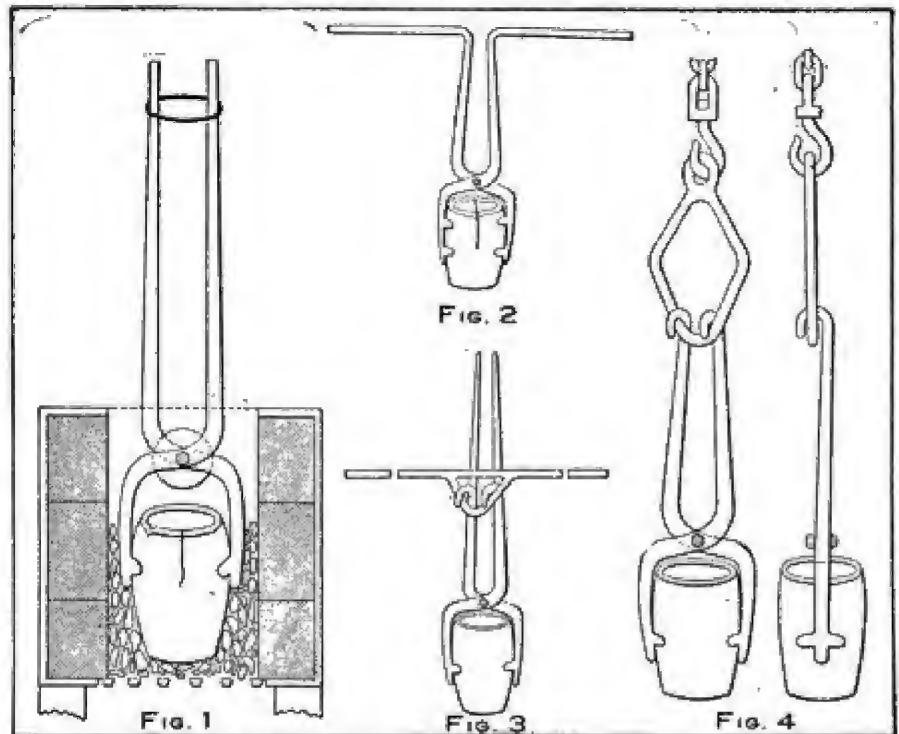
The lifting of the crucibles out of the furnace is another factor that affects the number of heats that can be safely made, says *The Foundry*. The tongs shown in Fig. 1 are properly styled "crucible crushers." A crucible in which 8 or 10 heats have been made does not require much force to crush it. The long arms on the tongs when pressed together sufficiently to slip the ring over them, exert a great force and crucibles are frequently flattened in this way. Tongs shown in Fig. 2 are not much better. By the use of these tongs the crucible is frequently only held at the top and the pot is easily crushed in this way.

A pair of tongs and a catching device are shown in Fig. 4, with which any crucible can be lifted without crushing. The pot is gripped a few inches below the center, and the fuel must be pushed aside to insure a firm hold. The tongs as shown in Fig. 4 are used in connection with hoists, while the arrangement shown in Fig. 3 is adapted for small foundries having no hoisting arrangement.

Ink Bottle Receptacle for the Drawing Board

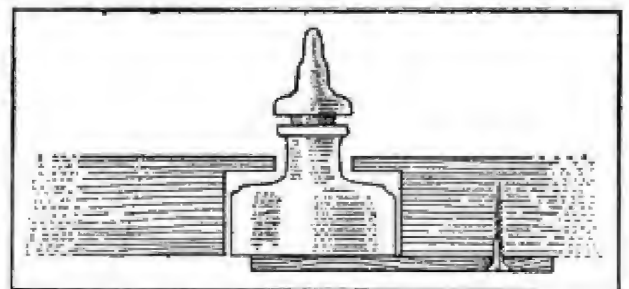
A device that can be readily applied to any drawing board of the ordinary thickness, say $1\frac{1}{2}$ in., to keep from knocking over the ink bottle, is shown

in the accompanying sketch. A hole is first bored large enough to easily admit the flange at the top of the neck on an ink bottle. This hole is then counter-bored from the bottom to the size necessary to easily take the largest diameter of the bottle and extended to within $\frac{1}{8}$ in. of the top of the board.



Different Types of Crucible Tongs

A thin piece of wood is fastened with a screw to the under side of the board, and this piece should have spring enough so it can be easily pushed under the bottom. This device has the disadvantage of having to be placed in the



Ink Bottle Set in the Board

corner of the board, and considerable time is lost in reaching for the ink, but one bottle spilled will waste time enough to do the extra reaching.—Contributed by W. E. Morey, Chicago.

Coat the inside of a glass show window with glycerine to keep the frost away.

Warm Garages Necessary in Cold Weather

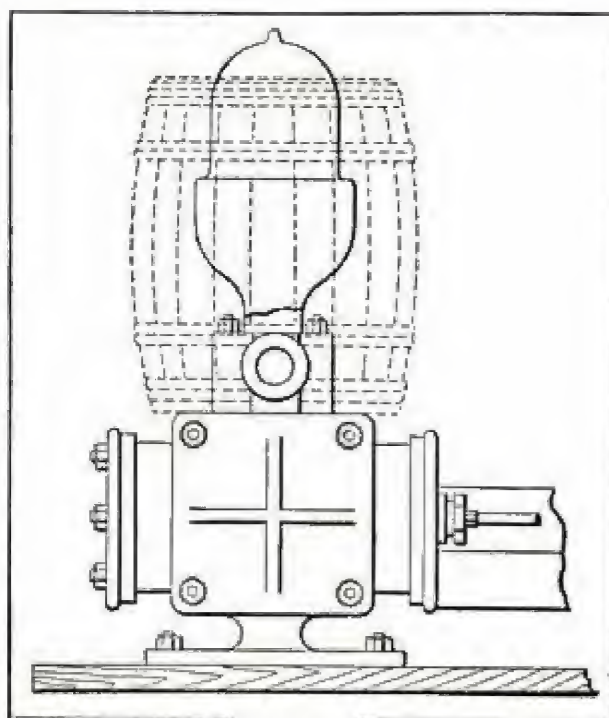
A warm garage is essential for the car that is to be run in the winter. This is true because the rubber of the tires is always full of moisture absorbed from the out-door air, and if the night be cold they will be frozen absolutely stiff by morning. Naturally there is a depression where the tire was in contact with the floor, and this remains until the rubber is thawed out. To run the car with the tires in this condition means ruin for the latter.

Another thing to be remembered by motorists is that gasoline does not vaporize so well in cold weather and hence a greater proportion of this fluid must enter the carbureter, particularly when the car is first started, says Automobile Dealer and Repairer. This is best accomplished by decreasing the amount of air entering the carbureter, thereby making the proportion of gasoline greater. A rag or old glove may be inserted into the air intake, so as to shut off the latter to some extent. Then when the engine is running normally this obstruction may be removed. A better device still is a cork which just fits the intake, and which is perforated by a small hole.

A Pump Repair with Cement

A steam pump was on duty keeping the water out of an excavation and by an unlucky swing of a derrick boom, a loaded dirt bucket struck the cast-iron air chamber of the pump, snapping it off just above the discharge connection, says American Machinist. A temporary repair was made by placing the broken parts in place and putting an empty barrel, minus the head and bottom, over it as shown in the sketch, cutting away the staves to allow for the discharge connections. All holes and openings between the barrel and the valve chest were then plugged up with cement sacks and the barrel filled with concrete.

The pump was shut down for a day or two to allow the concrete to harden.

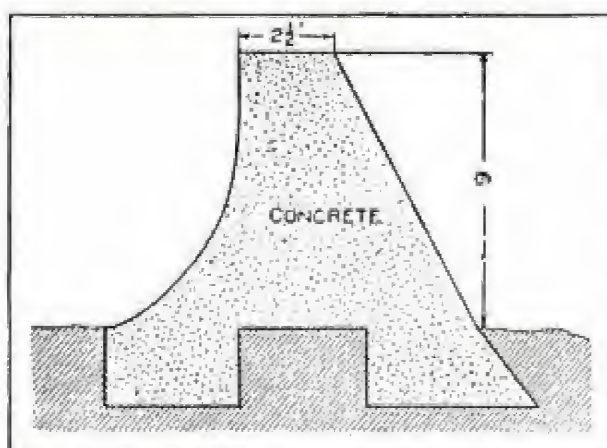


A Concrete Repair

After this repair the pump worked along as if nothing had happened and did duty until the job was finished.

One Style of Concrete Dam

There is nothing so good or so cheap for the construction of a dam as concrete. When building a dam use the best cement, 1 part, to 8 parts of sand and gravel. The only trouble with a concrete dam on a poor, sandy bottom is to keep the water from getting under it as in other dams, says a correspondent of American Miller. If a dam is to be made 9 ft. high it should be 9 ft. wide at the bottom and about 30 in. at the top. In soft bottom dig two trenches, leaving a strip of earth between, and slant them both ways—up

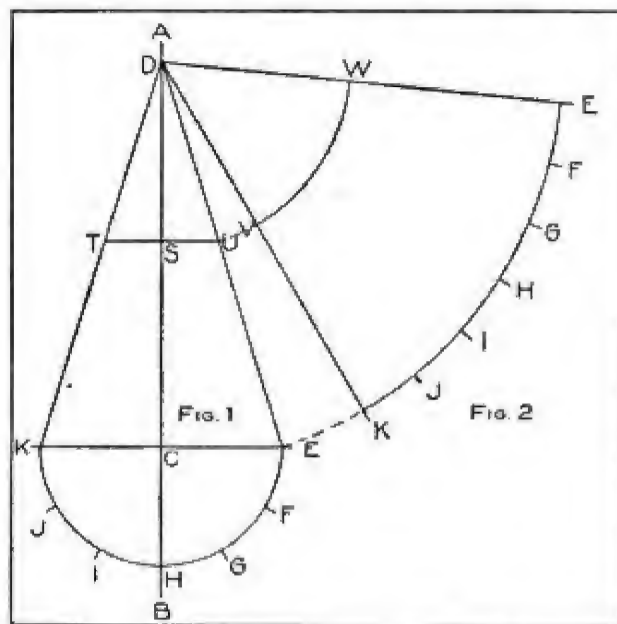


Feet to Prevent Water Washing Underneath

stream a straight slant and down stream in a circle, to make an apron, as shown in the sketch. The forebay or flume can be made of concrete mixed with 6 parts sand and gravel to 1 part cement. The wall should slant out on the inside at least 1 in. to 1 ft. and straight on the outside.

How to Make a Pattern for a Cone

First draw a center line AB, Fig. 1, and on this line mark the height of the cone from C, the base, to D, the



A Layout for the Pattern

vertex. The diameter of the base, KE, is marked out with equal radii from the intersecting lines at C. Draw a line from E to D and from K to D. A semi-circle, EHK, is described with C as a center and CE or CK as radius. This semi-circle is divided into equal parts as shown and represents one-half of the base.

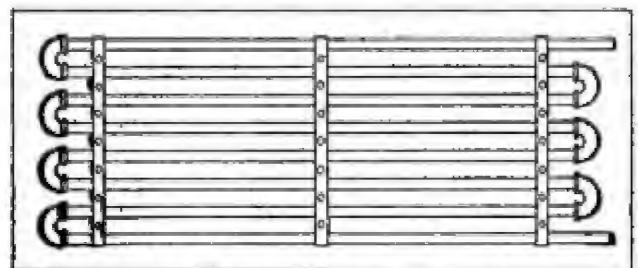
The pattern is made as shown in Fig. 2, by using D as a center and with a radii equal to DE describe an arc KE. Draw a line from D to K. Starting from K, lay out the divisions of the semi-circle the same as if it were stretched out straight from K to E. Draw a line from E to D. Then KED will be one-half of the pattern for the cone.

A pattern for a frustum or tin bucket is made in the same manner, using the

intersecting line at S, Fig. 1, for the height, from C, of the bucket. In this case KE would be the top of the bucket and TU the bottom. The diameter of the top KE is laid out the same as for the cone, and also the bottom, TU, is marked out in the same way. A line is drawn from E intersecting the point V and continued to point D. The line is drawn from K to D in the same way. In this case two arcs are described, KE and VW, Fig. 2. The semi-circle is drawn and the divisions are marked out as before and a half-pattern, KEVW, is obtained for a bucket.

Water-Cooled Pipe Grate Bars

A grate made as shown in the illustration is found to last a long time for burning lampblack, which is a product in gas manufacturing when the crude oil process of gas making is employed. This grate is made of 1-in. pipe, held together by three pairs of space bars having $\frac{3}{8}$ -in. bolts between the pipes, as indicated. The pipes are connected with cast-iron return bends $1\frac{1}{2}$ in. between centers. The pipes are cut in lengths suitable for the furnace and made up in sections of 6 to 10 pipes each. Through these pipes is circulated a stream of either salt or fresh water. Such grate bars are found to last several times as long as any cast or wrought-iron bars. In some cases feed



Water Flows Through the Pipes

water for the boilers has first been passed through the grates, which will raise the temperature of the water from 70 to 155 deg. A slight head of water will be needed for this purpose.

If paint is strained before using, it will cover more surface and wear better.

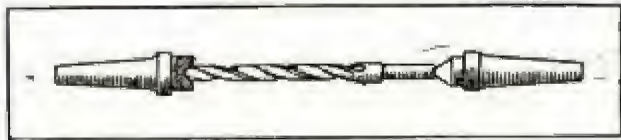
Acquiring Engineering Knowledge

[C. B. Auel in *Electrical Journal*]

"There are two ways in which expert knowledge in engineering can be obtained: indirectly, that is, through the experience of others as recorded in books, lectures, illustrations, etc., and directly, through personal experience. For the young college man there is no better way to obtain an insight into the practical side than by taking a full apprentice course with one of the many manufacturing concerns now offering them, and, if such an apprenticeship is entered upon during the college vacations, it will enable the benefits of a college course to be appreciated more fully and to be taken advantage of more largely in consequence."

Holding a Drill in Lathe Centers

When turning down the shanks of twist drills to fit certain collets the usual method is to clamp the drill in a chuck. If a number of drills are to

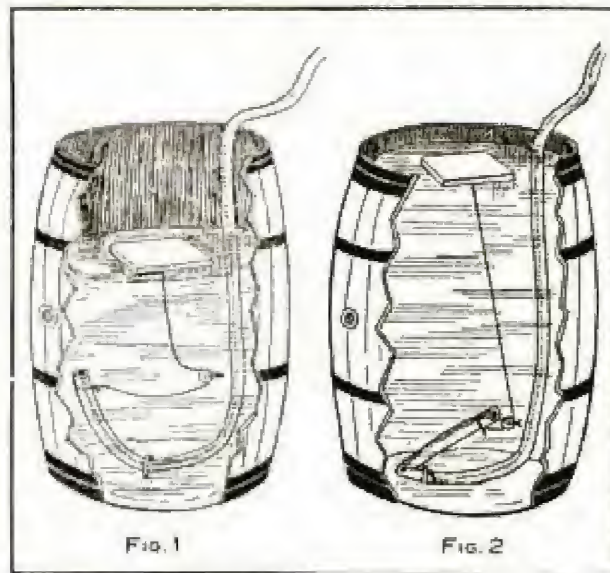


The Cutting Edges Will Turn the Drill

be fitted up in this manner considerable time will be lost in the operation. A very quick way is to make a cup center with the same angle as the lips of the drill and use it in the headstock of the lathe. Put the drill in this center as shown in the sketch and it will not be necessary to use any dog in turning as the lips of the drill will grip the center and act as a dog.

Home-Made Valve for a Hose

A kink in a hose will completely stop the flow of any water that may be passing through. This principle can be applied to a hose supplying water to barrels for the use of plasterers or sidewalk makers. The hose is fastened to the bottom of the barrel with a staple in such position as to allow sufficient



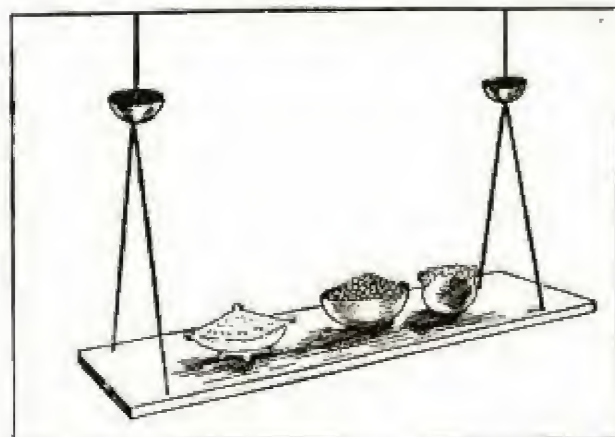
A Float Stops the Flow of Water

end to make a kink. A small rope or cord is attached to the end of the hose and then run through a staple or small pulley attached to the inside of a stave and a float fastened to the upper end as shown in Fig. 1. The rope should be just long enough so that when the barrel is filled the float on top will pull the hose over, making a kink as shown in Fig. 2, which will shut off the water.

The temperature in an engine room must be even, else the sight-feed oil cups will not feed with regularity.

Protecting Food from Ants

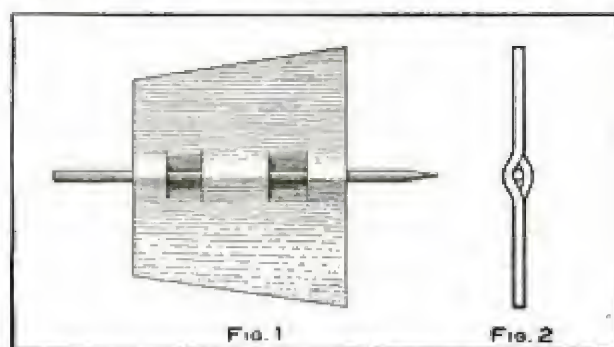
A very good way to keep ants away from food placed on shelves is to hang the shelf up by cords and place a gong from an old alarm clock on each cord as shown. Fill the gong with glue or mucilage. This makes it impossible for the ants to pass the gongs.



Ants Cannot Climb Down the Cord

How to Make a Tool-Makers' Depth Gauge

This depth gauge consists of a section of sheet metal with four cuts made across the center, as shown in Fig. 1. The strips made by the cuts are bent

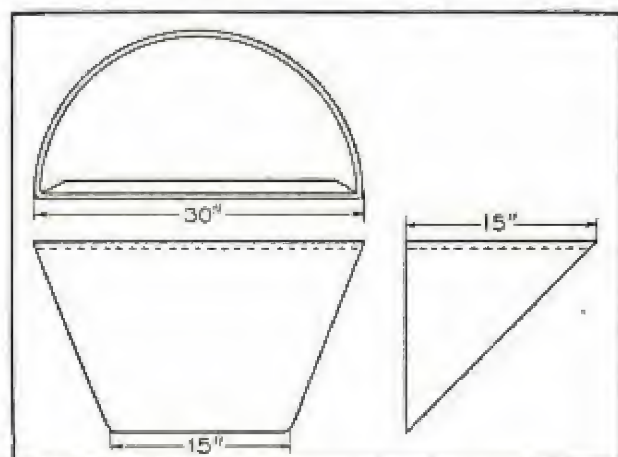


To Gauge the Depth of Holes

first in one and then the other direction. This will make a place through which a tool scriber or pointer can be inserted as shown in Fig. 2. The scriber or pointer must fit the opening close so it will stay at any place desired. The pointer can be graduated so the depth can be ascertained readily.—Contributed by Donald A. Hampson, Middletown, N. Y.

A Mine Sampler's Catching Bag

A catching bag constructed as shown in the sketch is used for sampling ores high up the steep face of a slope or at the back of a wet drive under which a cloth could not be placed. This bag consists of a semi-circular hoop of $\frac{3}{8}$ -in. round iron on which a canvas bag is sewn so it hangs from the hoop. The stitching should be done carefully

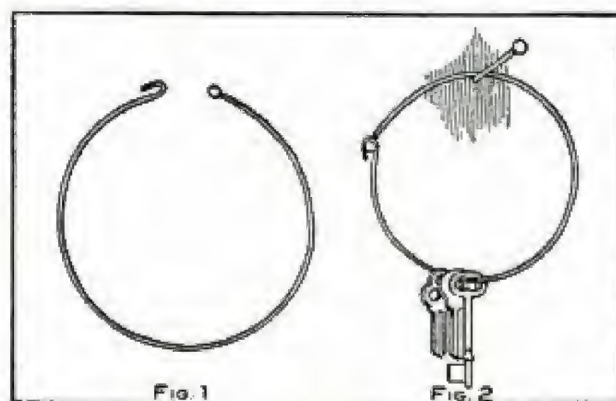


For Sampling Ores

around the bottom edge, and if any doubt exists as to any of the sample being retained in the bag, it may be used the reverse side out each time. The semi-circular side will be found convenient for getting into ordinary depressions, and the straight side for regular faces, while for acute depressions the corners can be used. In general mine sampling this device will be found invaluable.

A Handy Clasp Ring

A ring that can be made useful about a shop for hanging up nuts, washers, locks, blank keys and numerous small things can be made from a bicycle spoke. The spoke is bent into a circle and a hook made on the threaded end,



Ring for Holding Articles

as shown in Fig. 1. The articles are placed on the spoke and the hook slipped over the head of the spoke. The ring can then be hung on a nail as shown in Fig. 2. A ring can be made for each kind and size of article.—Contributed by Fred F. Friedl, Chicago.

Stopping a Leaky Hole While Drilling a Well

Nothing but clay should ever be used for the purpose of sealing a stratum at the bottom of a drill hole. The clay is fed down the drill pipe with a moderate flow of water and at the same time the drill is rotated and churned vigorously. This action will seal nearly any water flow in a short time and there will be no possibility of "jamming" the tools in the well.

How to Clean Paints

Oil-painted walls must be washed with soap and water, using a soft flannel cloth, and taking care to wring it well before using, says The Modern Painter. Use cold water to finish, and dry well with linen duster.

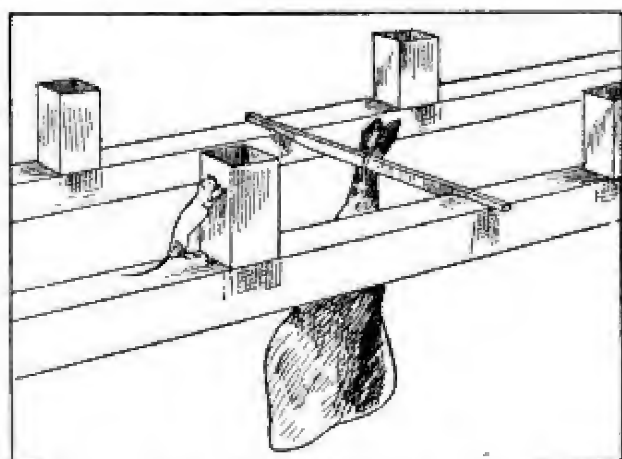
Varnished woods should be rubbed with a chamois leather wrung out of cold water, then polished with soft duster.

To polish a varnished floor rub well with equal quantities of beeswax and turpentine. Another method is to take equal parts of olive oil and spirits of turpentine, wet a cloth with these, rub the wood hard, then rub with a dry cloth. This is also good for black walnut furniture and sewing machines.

Where paint is stained with smoke some ashes or potash lime may be used. A soft linen cloth should be used for wiping dry.

Keeping Rats from Meat

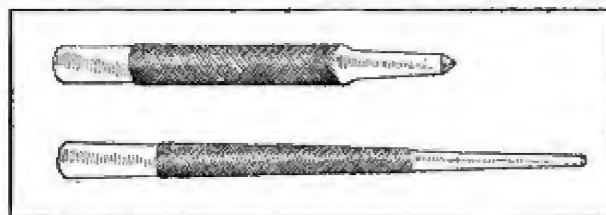
Meat hung up on gambrels between joists can be protected from mice and rats as shown in the illustration. The tops are removed from four empty, square varnish or filler cans and each partly filled with water. One can is set on the end of each joist with the gambrels on which the meat hangs in between them, as shown. A rat cannot pass the cans and if he gets over one edge of the can he falls into the water and drowns.—Contributed by P. I. Wright, Santa Rosa, Calif.



The Rat Cannot Pass the Can

Home-Made Center Punch and Nail Set

Take a piece of round file about 4 in. long, draw the temper and file smooth about 1 in. on each end. File one end flat and the other pointed, tem-

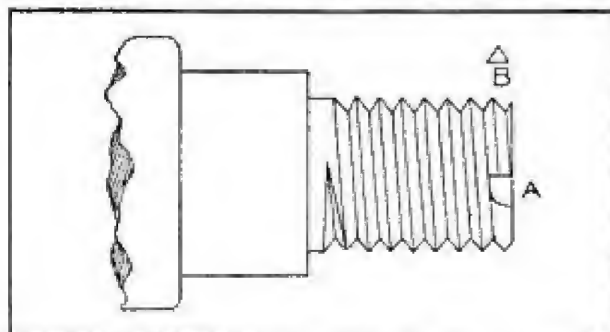


Center and Nail Punch

per and you will have a first-class center punch. A nail set is made in the same manner, only a little longer piece is used and more slant filed on the punch ends so it will not make a larger hole in the wood than a nail.

Keeping the Threads of a Chuck or Face Plate Clean

File or chip a notch in one thread, as shown at A in the sketch, leaving the face or advancing edge of the thread flat, or as shown at B. This will not



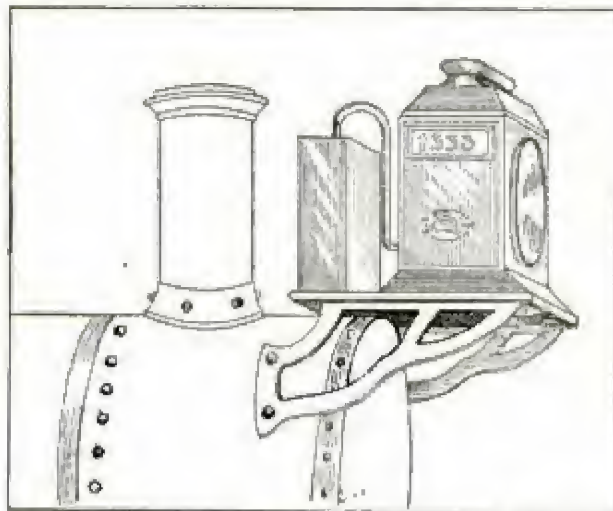
The Notch Keeps the Thread Clean

allow dirt or chips to collect in the thread, as each time the face plate or chuck is screwed on this little notch or flute catches the dirt. When the face plate, or chuck, is removed clean out the little notch and there will be no trouble from dirt.—Contributed by Martin D. Watrous, Ansonia, Conn.

Copper floats used in water closet tanks can be tested for leakage by holding them over a flame. The heat will quickly make steam from the water within, which will force its way out through the hole.

Using Acetylene Gas in a Locomotive Headlight

A locomotive engineer on a small branch railroad became tired of his old oil lamp for the headlight and secured

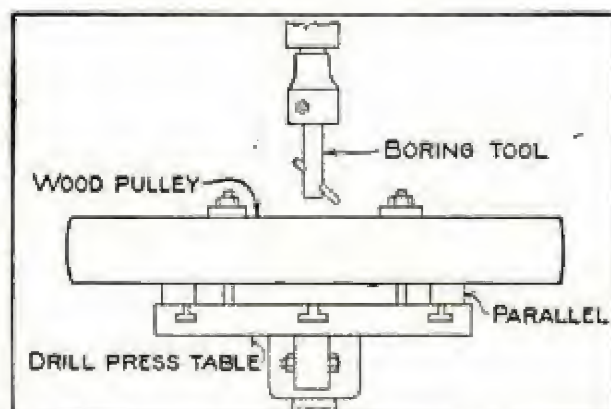


Acetylene Gas Makes a Brilliant Headlight

an acetylene gas generator used for lighting lamps on an automobile and placed it on the bracket just behind the headlight of his engine. He placed an acetylene burner in the pit of the reflector and connected it with a small pipe to the generator. This gave him a better light, which could not be excelled outside of the electric headlight.

Radial Drill Used for Boring Hubs

There was brought to our shop one day a 4-ft. wood pulley to have the hub bored out 1 in. larger. Our largest lathe would swing only 28 in., so parallels were placed on the radial drill and the wheel bolted on top of them. A

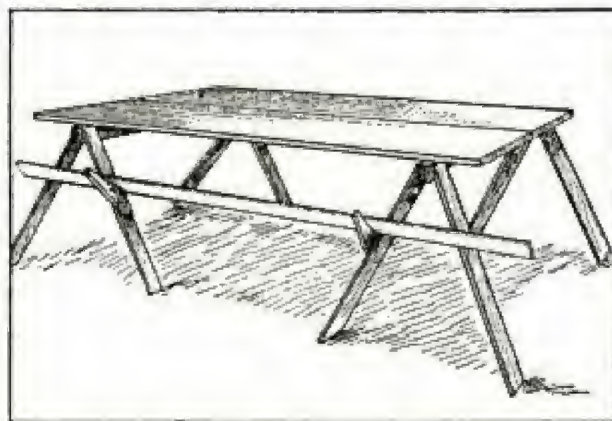


Method of Boring the Hub

piece of wire was put in the drill chuck and bent with a pointer, the whole length of the wire being equal to the radius of the wheel, and the wheel trued up with the pointer. A boring tool was placed in the chuck, as shown in the sketch, and fed through the hub at a good rate of speed. The time consumed was no more than if the work was done on a lathe.—Contributed by Donald A. Hampson, Middletown, N. Y.

Handy Place for a Paper-Hanger's Straightedge

When the paper-hangers were fixing up the rooms of our house I saw them place the straightedge leaning against a wall or on the floor when not in use. I suggested nailing two strips of wood to the front legs of the horses, as shown in the illustration, on which to place the straightedge, or, better still, to prevent the strips being knocked off or to better support the straightedge, run



Two Pieces of Wood Hold the Straightedge

strips of wood all the way across from the front leg to the back of each horse.

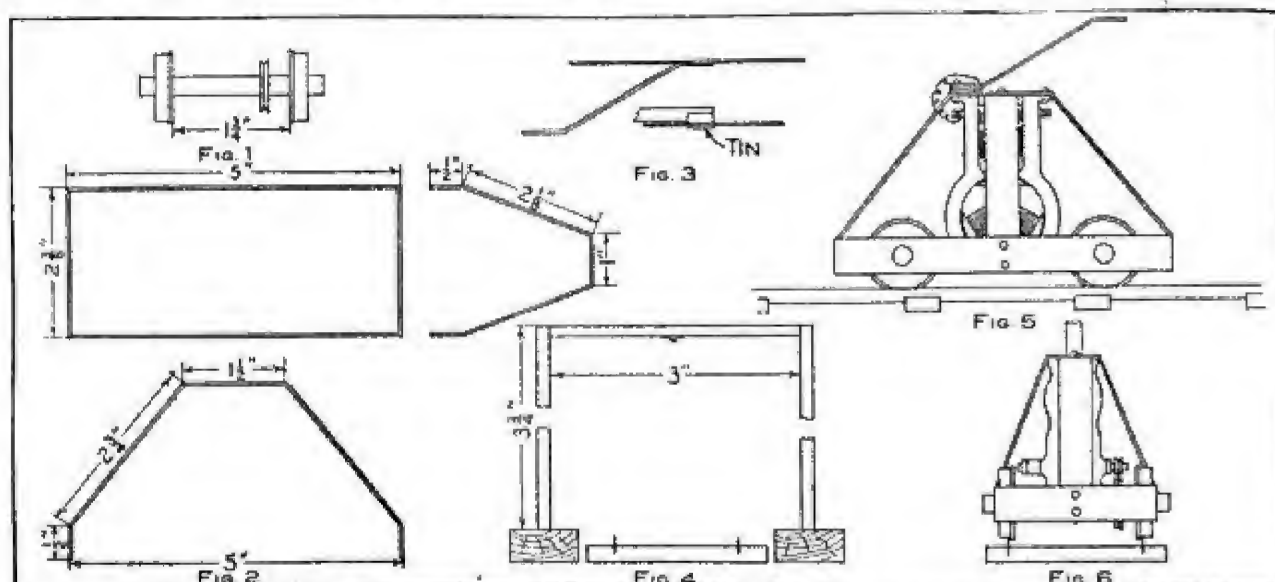
Some paper-hangers use screw hooks and eyes, the eyes being placed on the under side and at the end of the main piece of the horses, and the hooks fastened to the back side of the straightedge. While this plan is better than placing the tool on the floor or leaning it against the wall, the scheme is not so good as the first one, as the horses must be placed at a certain distance apart in order to make the hooks and eyes match.—Contributed by I. G. Bayley, Cape May Point, N. J.



HOW TO MAKE A MINIATURE ELECTRIC LOCOMOTIVE

A miniature electric railway is the one thing that attracts the attention of almost any person. The cost of a toy electric locomotive is beyond the reach of many boys who could just as well make such a toy without much expense and be proud to say they "built it themselves." The electric locomotive described herewith uses for its power a small battery motor costing about \$1. The first thing to do is to make the wheels and axles. If you do not pos-

in. holes 1 in. from the ends and insert the ends of the axles. The other two pieces are $\frac{1}{2}$ in. wide and of the dimensions shown in the sketch. These pieces are riveted in the middle of the oblong frame, each in its proper place. The motor is now bolted bottom side up to the top of the piece fastened to the frame lengthwise. A trolley, Fig. 3, is made from a piece of clock spring, bent as shown, and a small piece of tin soldered to the top end for a brush



The Different Parts for Making the Electric Locomotive

sess a lathe the wheels can be turned at some machine shop. Four wheels are made from a round bar of metal, as shown in Fig. 1. Each wheel is $\frac{1}{4}$ in. thick and 1 in. in diameter with a $\frac{1}{8}$ -in. flange and a $\frac{1}{4}$ -in. hole drilled in the center. Each pair of wheels are fitted on a $\frac{1}{4}$ -in. axle about $2\frac{3}{4}$ in. long. One of the axles should be fitted with a grooved belt wheel, as shown. Make the frame from three pieces of heavy brass, as shown in Fig. 2.

The first piece or main part of the frame is made from brass $\frac{3}{4}$ in. wide and 16 in. long, bent into an oblong shape and the ends soldered or bolted together. If the ends are to be soldered, before doing so drill four $\frac{1}{4}$ -

connection. A groove is made in the tin to keep the trolley wire in place.

The trolley wire is fastened to supports made of wood and of the dimensions given in Fig. 4. The trolley should be well insulated from the frame. The parts put together complete are shown in Fig. 5. Run a belt from the pulley on the motor to the grooved wheel on the axle, as shown in Fig. 6, and the locomotive is ready for running.

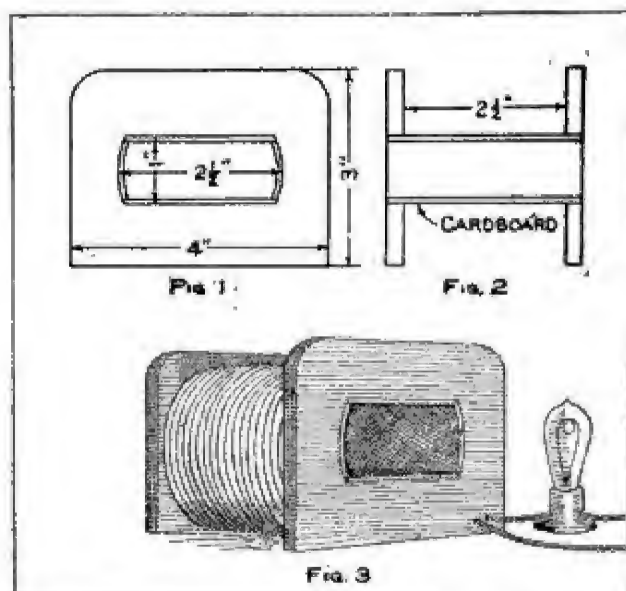
One connection from the batteries is made to the trolley wire and the other to a rail. The connection for the motor runs from one binding-post to the trolley and this connection must be well insulated to avoid a short cir-

cuit. The other binding-post is connected to the frame.

The cost of making the wheels and purchasing the track will not be over \$1.50. The track can be made from strips of tin put in a saw cut made in pieces of wood used for ties. This will save buying a track.—Contributed by Maurice E. Fuller, San Antonio, Texas.

Demagnetizing a Watch

A test can be made to know if your watch is magnetized by placing a small compass on the side of the watch nearest the escapement wheel. If the compass pointer moves with the escapement wheel the watch is magnetized. A magnetized watch must be placed in a



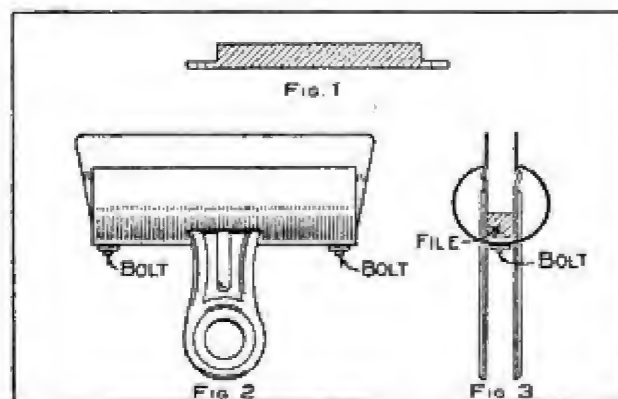
Watch Demagnetizer

coil that has an alternating current of electricity flowing through it to remove the magnetism. A demagnetizer can be made as shown in the illustration. Two end pieces for the coil are made as shown in Fig. 1 from $\frac{1}{4}$ -in. wood. These ends are fastened together, Fig. 2, with cardboard 3 in. long glued to the inside edges of the holes cut in them. Wind upon the spool thus formed about 2 lb. of No. 16 cotton-covered copper wire. As it will be necessary to place a 16-cp. lamp in series with the coil, both the coil and lamp can be mounted on a suitable base and connected as shown in Fig. 3. The current, which must be

110-volt alternating current, is turned on the lamp and coil and the magnetized watch slowly drawn through the opening in the center of the coil.—Contributed by Arthur Liebenberg, Cincinnati, O.

How to Make a Pocket Skate Sharpener

Secure a square file and break off a piece, Fig 1, the length of a paper clip, Fig. 2. Draw the temper in the ends of this piece of file, but do not heat the center. This can be done by wrapping a wet piece of cloth or asbestos around the middle and holding it in the jaws of a pair of tongs which will only leave the end uncovered and projecting from the tongs about $\frac{1}{2}$ in. Hold this projecting end in a flame of a plumber's torch until it is a dull red. Allow this to cool slowly while in the tongs. When cold treat the other end in the same way. This will draw the temper in only the ends which are filed, as shown in Fig. 1, and holes drilled in them. Also drill a hole in each end of the spring on the paper clip to match those drilled in the piece of file. Fasten the file in the clip with small bolts, as shown in Fig. 3. When the file gets filled with filings it can be removed and cleaned. Place the runner of the skate in the clip and hold flat on the surface of the runner. If the piece of file is fitted to the same width as the skate runner, the sides of the paper clip will hold the file level with the surface of the runner without any trouble. Push the clip back and forth until the skate is sharpened.



Sharpener for Skates

Old-Time Magic

Trick with a Coin in a Wine Glass

The accompanying sketch shows a trick of removing a dime from the bottom of an old-



fashioned wine glass without touching the coin. The dime is first placed in the bottom of the glass and then a silver quarter dropped in on top. The quarter will not go all the way down. Blow hard into the glass in the

position shown and the dime will fly out and strike the blower on the nose.

Untying-a-Knot Trick

Tie a double knot in a silk handkerchief, as shown in the accompanying sketch and tighten the last tie a little by slightly drawing the two upper ends; then continue to tighten much more, pulling vigorously at the first corner of the handkerchief, and as this end belongs to the same corner it cannot be pulled much without loosening the twisted line of the knot to become a straight line. The other corner forms a slip knot on



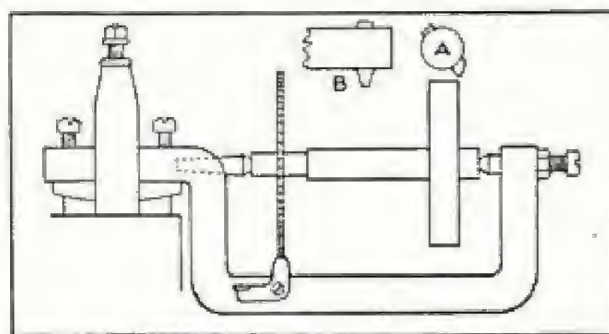
the end, which can be drawn out without disturbing the form, or apparent security of the knot, at the moment when you cover the knot with the unused part of the handkerchief.

When the trick is to be performed, tie two or three very hard knots that are tightly drawn and show your audience that they are not easy to untie. The slip knot as described then must be made in apparently the same way

and untied with the thumb while the knot is in the folds of the handkerchief.

Gear-Cutting Attachment for Small Lathes

When in need of small gears for experimental or model machines the amateur usually purchases them, never thinking that he could make them on his own lathe. A small attachment can be made to fasten in the tool post of a lathe and the attachment made to take a mandrel on which to place the blank for cutting a gear. The frame is made from a $\frac{1}{2}$ -in. square iron bent as shown in the sketch with the



Gear-Cutting Attachment for Lathes

projecting end filed to fit the tool post of the lathe. A pair of centers are fitted, one of which should have a screw thread and lock nut for adjustment in putting in and removing the mandrel.

All the old clock wheels that can be found should be saved and used for index wheels. All of these wheels should be fitted to one end of the mandrel. The blank wheel is put on the outer end of the mandrel and a clock wheel having the number of teeth desired placed on the other end. When the mandrel is put in between the centers a small pawl is fastened with a screw to the frame with its upper end engaging in a tooth of the clock wheel. One clock wheel will index more than one number of teeth on a blank wheel. For instance: if the clock wheel has 18 teeth it can be made to index 6, 9 or 18 teeth to the blank by moving the number of teeth each time 3, 2 and 1 respectively.

In the sketch, A shows the end of

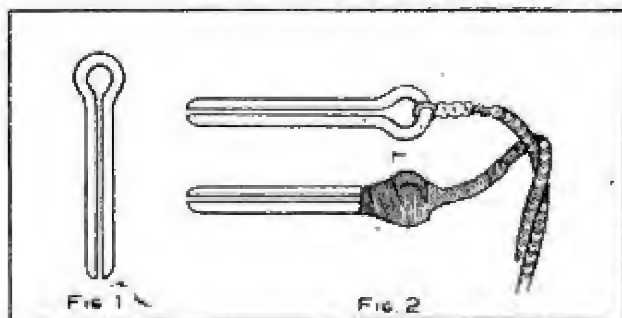
the cutter and B the side and the shape of the cutting tool. When the cutter A, which is in a mandrel placed in the centers of the lathe, has finished a cut for a tooth, the pawl is disengaged and the mandrel turned to another tooth in the clock wheel.

In order to get the desired height it is sometimes necessary to block up the lathe head and the final depth of the tooth adjusted by the two screws in the projecting end of the frame which rests on the rocker in the tool post. Should too much spring occur when cutting iron gears the frame can be made rigid by blocking up the space between it and the lathe bed.

The cutter mandrel is placed in the centers of the lathe, or should the lathe head be raised, a short mandrel with the cutter near the end can be placed in a chuck, and adjusted to run true. The frame holding the mandrel, gear blank and clock wheel is inserted in the tool post of the lathe and adjusted for depth of the cutter. The lathe is started and the gear blank fed on the cutter slowly until the tooth is cut. The pawl is released and the mandrel turned to the proper number of teeth and the operation repeated. In this manner gears 3 in. in diameter can be made on a 6-in. swing lathe.—Contributed by Samuel C. Bunker, Brooklyn, N. Y.

Wire Terminals for Battery Connections

Good connections on the end of wires for batteries can be made from cotter pins, Fig. 1, about $1\frac{1}{2}$ in. long. Each end of the wire is put through the eye of a cotter pin, twisted around itself



Cotter Pin Wire Terminals

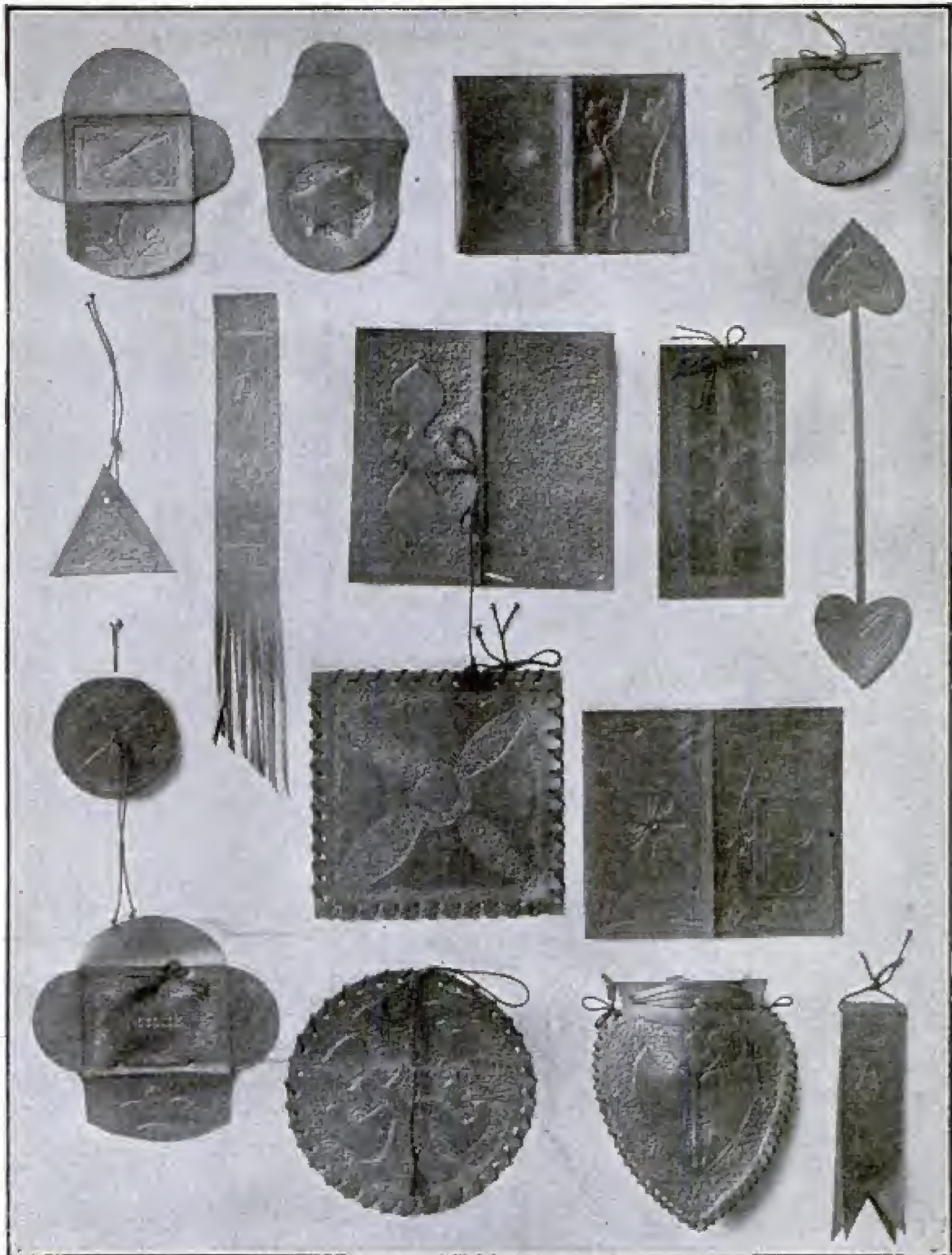
and soldered. The connection and eye are then covered with tape as shown in Fig. 2. When connecting to batteries, spread the pin and push the parts under the nut with one part on each side of the binding-post. When the nuts are tightened the connection will be better than with the bare wire.—Contributed by Howard S. Bott.

Simple Arts and Crafts Leather Work

Very interesting and useful pieces of leather work can be done with nothing more for equipment than a cup-pointed nail set such as carpenters use, and a nut pick.

The accompanying illustrations show some of the things that can be made. Beginning at the left and reading to the right they are:—Case for court-plaster, coin purse, lady's card case, eye glass cleaner or pen wiper (has chamois skin within). Second row:—Two book marks, note book, blotter back, book mark. Third row:—Pin ball (has saddler's felt between the two leather disks), tea cosey, gentleman's card case or bill book. Fourth row:—Needle or pin case, tea cosey, lady's belt bag, watch fob ready for fastenings.

Procure a piece of Russian calf modeling leather. (1.) Make on paper the design wanted. (2.) Moisten the back side of the leather with sponge or cloth with as much water as it will take yet not show through on the face side. (3.) Place the leather on some hard non-absorbent material, such as brass or marble. (4.) Place the paper design on the leather and, holding it in place with the left hand, trace the outline of the object and the decorative design with the nut pick so as to make a V-shaped groove in the leather. (5.) Take the paper off and working on the leather directly make the grooves deeper. (6.) With the cup-pointed nail set stamp the background promiscuously. This is done by making an effort to hold the point of the set about $\frac{1}{4}$ in. above the surface, at the same time striking light, rapid blows on the top with a hammer or mallet.



This Work Is Done with a Nail Set and Nut Pick

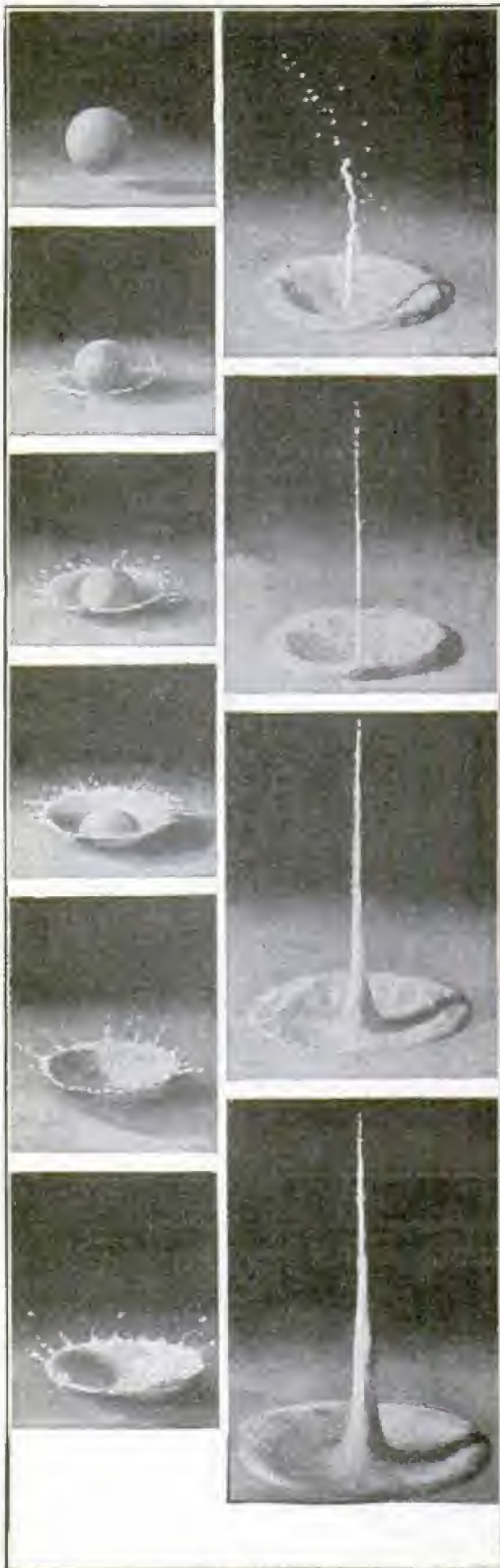
With such objects as coin purses and card cases, a sewing machine will be needed to fasten the parts together. An ordinary machine will do. Frequently the parts are fastened by punching holes and lacing through these with leather thongs or silk cord.

In making symmetrical designs such as are here shown, draw center lines

across the required space, dividing it into as many parts as desired. Make free-hand one quarter of the design, if four parts are to be alike, or one-half of the design, if but two parts. Fold over along these center lines. Put a piece of double-surfaced carbon paper between the parts and trace over the design already drawn.

A Study of Splashes

When a rough, or greasy, or dusty sphere falls into a liquid, the liquid is



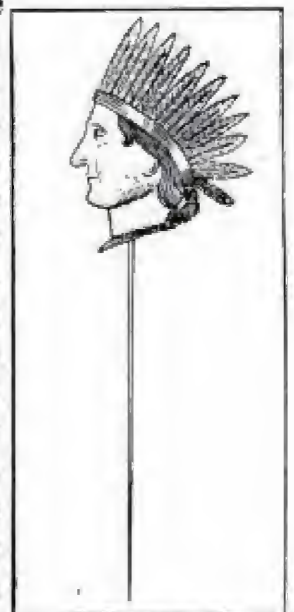
Splashes from a Sphere in Milk and Water

forced away from the sphere. If the sphere is quite smooth the liquid rises up around and enclosing it in a sheath, says Knowledge and Scientific News.

Reproduced herewith are a series of photographs showing successive stages in the entry of a rough sphere into milk and water, and the resultant "basket splash." The diameter of this sphere was about $3/5$ in., and the height of the fall about 6 in. Examination of the photographs shows that the liquid, instead of flowing over and wetting the surface of the sphere, is driven violently away, so far as can be seen from the photographs, the upper portion is, at first, unwetted by the liquid. The gradual thickening of the crater wall and the corresponding reduction in the number of its lobes as the subsidence proceeds is beautifully shown. Thereafter there rises from the depth of the crater an exquisite jet which in obedience to the law of segmentation at once splits up in its upper portion into little drops, while at the same time it gathers volume from below and rises ultimately as a tall, graceful column to a height which may be even greater than that from which the sphere fell.

How to Make a Stick Pin

A fine stick pin or button can be made from a new one-cent piece. Carefully file out all the metal around the Indian head and slightly round the edges. Solder a pin to the back of the head when it is to be used for a stick pin. If a collar button base is soldered to the back of the head instead of the pin it can be used for a button. These can be gold plated by a jeweler and then you will have a neat pin or button, or a good emblem for the Order of Redmen.



ROOF-CLIMBING APPARATUS.—There is always a danger of slipping while working on a steep gabled roof, especially on wet days. The device shown in this illustration is designed to make just such accidents impossible, and is specially adapted for use in making small roof repairs, such as replacing broken shingles and mending leaks. Nailing strips of scantling in a roof as supports for the workers is thus made unnecessary.

The device comprises a curved plate, lined on the inner side with felt, and fitted with spurs. The spurs at the lower end project a greater distance than the upper ones. The lower strap passes over the instep, and the upper one is buckled around the leg just below the knee. (Fig. 1.)

NAILLESS HORSESHOES.—The nailless horseshoe shown in this illustration is an interesting invention. It is fastened to the horse's hoof by a steel ring which is connected with the shoe by hinged plates at the front, sides and back. The ring is tightened around the hoof by a screw attachment. (Fig. 2.)

SELF-RIGHTING LANTERN BAIL.—The problem of a freely swinging lantern bail, or handle, that will retain an upright position when not in use, has been solved by a California inventor. Attached to the bail below the pivotal point in the dome of the lantern is a weight sufficient to keep the handle upright when not in use, yet will allow a free swing to the lantern when desired. (Fig. 3.)

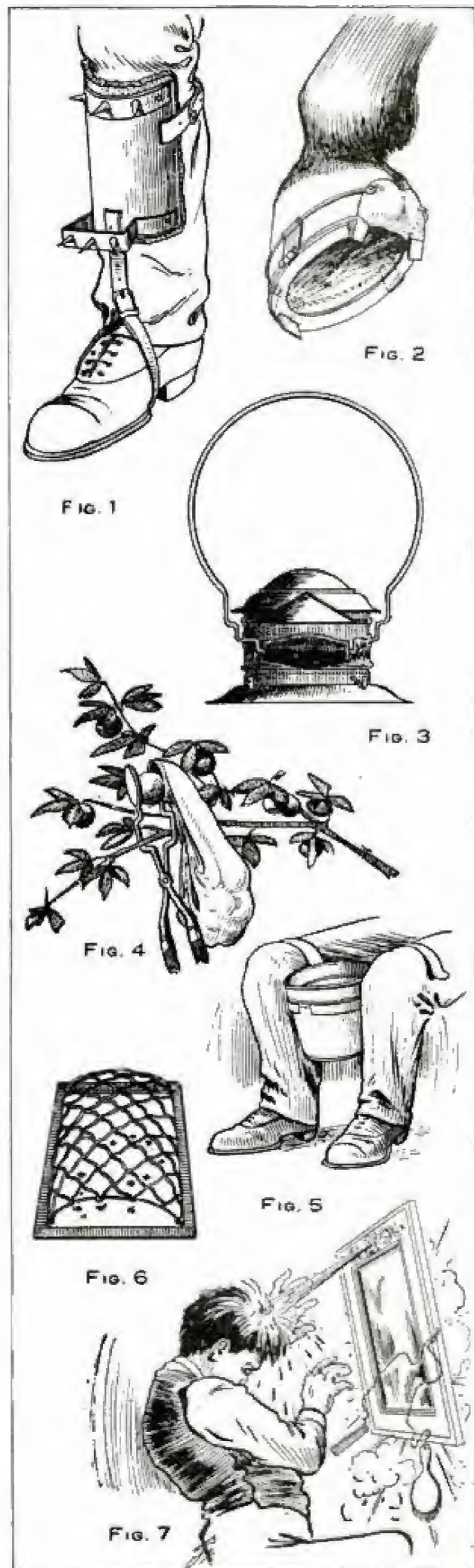
AN INGENUOUS FRUIT PICKER.—Although a great many fruit pickers of the type shown in this illustration have been invented in the past few years, it is probable that but very few of the farmers in this country have adopted them, although they are now being used by nearly all extensive growers of large fruit.

One of the jaws of this picker is composed of a ring with a long, narrow bag attached to it. The end of the other jaw, which is a solid disc, forces the fruit through the ring of the bag, this action also severing it from the branches. The jaws are so shaped just below the rings that it is possible to close them over a branch that otherwise would make the picking of the fruit impossible. (Fig. 4.)

HOLDER FOR MILK-PAILS.—The necessary practice of holding the pail between the knees in milking cows, or for other purposes which keep both hands busy, is made much easier by this device. The ring, with its two attachments or wings so shaped as to rest easily across the legs just above the knees, is slipped over the pail from the bottom up. (Fig. 5.)

A FLYPAPER PROTECTOR.—Flypaper has an aggravating habit of catching books, handkerchiefs and many other small things, to say nothing of persons, as well as its legitimate task of catching flies. This flypaper holder and protector limits its activity to the catching of flies only. It comprises a base on which the flypaper is placed and a detachable woven wire cage of curved form, so arranged that its sides will fit snugly inside the frame of the base. (Fig. 6.)

TRICK MIRROR.—This mirror, loaded with all kinds of surprises, is warranted not to divulge its possibilities until the perpetrator of the joke is at a safe distance from his victim. A comb and brush hang by chains from the frame and when these are handled a deafening explosion results and a tube in the top of the frame expels water or other liquids into the victim's face. (Fig. 7.)



A TRIP BELOW

By Geo. S. Goldie in the Motor Boat

"It will be an hour before the channel ranges are set and we can do nothing until then, so hurry and get into the suit and we will send you down."

Quickly divesting himself of his coat, hat, shoes and cuffs, and still wearing his collar, tie and watch, to make an impression on the mermaids, no doubt, the novice donned a heavy sweater, thick socks and a knit skull cap, and the process of inserting him into the diving suit began, and never was lady more carefully attended or more scrupulously dressed.

The heavy suit was drawn on, the ends of its legs being the same shape as rubber boots; the ends of the arms had a deep band of elastic clasping the wrists tightly; the opening at the neck was wide. A pair of lovely brass shoes of about ten pounds each, and similar to a Chinaman's were slipped on and strapped to the ankles; then woolen mittens, for it was the latter part of January, and then the diver's waterproof mittens, which had long rubber gauntlets. Within an inch of the top the gauntlets were lashed to the arm by six turns of fishline, each half turn being drawn as tight as a strong man could pull it; the thickness and strength of the suit prevented pressure on the arm. The heavy plate which protects the breast, shoulders and back from water

pressure was slipped over the new diver's head, great care being taken not to bark his nose during its passage.

The top part of the suit was pulled up smoothly inside the armor, and a broad, heavy band that is attached to the suit, with holes in it to correspond with screw bolts projecting from the lower edge of the armor, was forced up on the outside and the holes slipped over the bolts. A strong metallic band in sections was slipped over the bolts and the whole fastened air tight by thumb screws firmly set down with a wrench—and the new diver lumbered out of the warm engine-room to the open deck.

About this time, one of the crew said in an undertone, "Let me see, where is it that the suit leaks, Tom?"

"I don't know," whispered Tom, "but I think it leaks in two or three places."

"Never you mind the leaks, just keep the air pump going," said the novice.

The life-line was slipped under his arms and he stepped on the diving ladder, a weight of about fifteen pounds was hooked on his breast and another one on his back; he groaned, for the little bones on top of his shoulders were throbbing with the weight, the whole outfit resting accurately upon them.

The air pump was started, and amid chatting the signals were explained, the helmet twisted on, the familiar pat on the head given (all right to go below signal), when the novice felt as though plugs were being driven through his ears. He guessed it was too much air, and signaled on the pipe "one;" but as "one" is more air he got it, and opened his mouth to relieve the pressure on the ear drums.

Rapping on the helmet caused them to take it off; the signals were explained, the helmet twisted on, signals given for less air (two pulls on air pipe), until it felt perfectly natural, and the new diver went down and off the ladder, the green water appearing to rise and envelop him as he sank amid a mass of bubbles. But he didn't give a rap what he sank amidst if he could only get out of sight of the crew above, who he felt were having their share of the fun. His earnest prayer was that they would not see the fierce battle he was having with the lighter, as it persisted like a devouring monster in trying to suck him under it.

A thought occurred to him, and by pressing his elbows to his sides the air was pressed out of the suit, and he went to the bottom with neatness and dispatch.

The weight of the suit had disappeared, it no longer bore on the knobs of his shoulders; the loads on his feet might have been lost, they interfered so little. Filled with joy he rambled around the bottom and then started looking for rocks or sand; all he could find was mud, and



even that was lost as he found himself treading on nothing. The arms had been permitted to come a little too high and air had gone into them, lifting the diver from the bottom.

While on the bottom it is customary for a diver to travel on his hands and knees, wearing hand and knee pads to protect the suit. When in that position, or lying prone, the air will sometimes work into the legs; then the body fills and the diver shoots to the surface feet first; he is hauled aboard by the life-line and righted, and rested. A few minutes' standing on one's head will give a sample of what he endures.

When the water is at the freezing point, sometimes while below the air vent will freeze; then the suit becomes rigidly distended with air and the diver a helpless prisoner, unable to move, and up he goes, and woe betide him if inside a vessel, for then he sticks firmly against whatever forms the ceiling. If in the open and the life-line or the air-pipe do not catch in anything, he shoots quickly to the surface.

Sometimes the man at the pump will send down air faster than the vent allows it to escape; that is called pumping him up, and the diver will fly half his length out of the water, shaking his fist in a tearing rage, and no doubt swearing enough to break up a Sunday school meeting, but no one hears him. Some helmets have a telephone, and perhaps an electric light, but a great part of a diver's work is done in darkness, largely by feeling.

The captain of our craft was once taking cargo out of a vessel sunk in Hell Gate in about 100 ft. of water when he felt a strange sensation; the vessel had been lightened so much that it was rising with him. Again, not long ago, he went into a sunken submarine, traveled nearly her length with the aid of an electric light and was within a few feet of his object when the electricity gave out, leaving him in complete darkness to find his way out of that maze of machinery and passages, with an air-pipe and a life-line dangling from him. Three times last winter did the air vent freeze while he was below; and on this same day, as he was going to descend, after the voice had come up, the air vent had to be thawed out.

But let us hurry back to the new diver; we left him suspended, like the sailors in Bowling Green who could not get to heaven and had been kicked out of hell, squeezing the suit too vigorously landed him suddenly about five inches deep in the mud.

His explorations were soon brought to a standstill; three times did he dig his feet into the mud and brace against the life-line, but it would not budge; he could see only the long slant of it that he was some way out from the lighter, and guessed that it was a hint to be more sociable; so he wandered back, gazing at the glint of the sun from off the air-pipe which shone like burnished silver, and at the ceiling-like surface of the water, beyond which he could see nothing. It was like being in a room the side walls of which could not be seen.

Regretfully he gave the signal (three pulls on the life-line) to ascend and was hauled in rapidly hand over hand by the man attending the lines. The sensation of that rise was like floating through space.

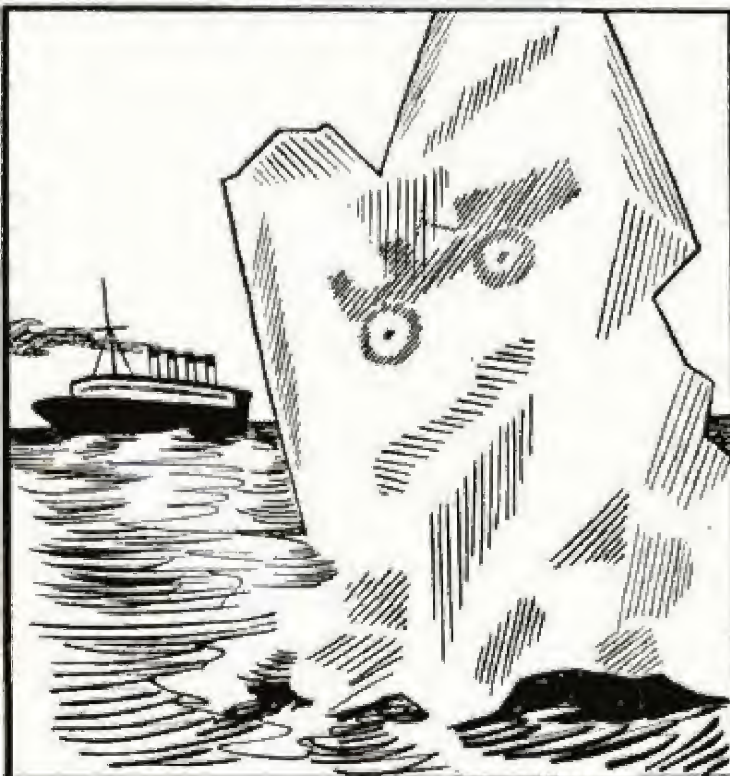
NEW BOOKS

MASONRY AND REINFORCED CONCRETE.—By Walter Loring Webb and W. Herbert Gibson. Cloth; 400 pp.; 300 illus. Price, \$3.00. A working manual of approved American practice in the selection, testing and structural use of building stone, brick, cement and other masonry materials, with complete instruction in the various modern structural applications of concrete and concrete steel. The work includes three parts: Masonry and Concreting Materials; Stone Masonry and Plain Concrete Construction; Reinforced Concrete; also a complete index. The American School of Correspondence, Chicago.

PATENTS AS A FACTOR IN MANUFACTURING.—By Edwin J. Prindle, of the New York Bar. Cloth; 134 pp.; 12mo. Price, \$2.00. This work is designed to rightly direct the inventor's or manufacturer's course in the early steps usually taken before the advice of counsel is secured. The chapters include: Influence of a patent in controlling a market; Subject, nature and claim of a patent; What protection a patent affords; Of infringements; Patenting a new product; Patent relations of employer and employee; Contests between rival claimants to an invention. The Engineering Magazine, New York.

PUMPS AND HYDRAULICS.—By Wm. Rogers. Two cloth bound volumes containing nearly 900 pages and illustrated with about 700 wood cuts. Size, 6 by 9 in. Price, \$4.00. A valuable work for superintendents, engineers, power pump attendants and machinists. Treats on the construction, operation, care and management of pumping machinery, the principles of hydraulics being also thoroughly explained. The illustrations depict work actually constructed and in operation; the rules and explanations of the examples shown are taken from everyday practice. Seriously educational in its plan and scope, and progressive in the presentation of its subject matter. Theo. Audel & Co., New York.

THE SCIENCE YEAR BOOK FOR 1909.—Edited by Major G. F. S. Baden-Powell. Cloth. Price, \$2.50. Contains Postal Rates; Notes and Tables covering Astronomy, the Earth and its Inhabitants, Physical and Chemical Notes, Metrology; Science in 1908; Glossary; Directory, including Periodicals, Public Institutions, Universities, Societies, Prizes and Awards, Abbreviations; Biographical Directory; Diary; Index. A valuable reference work published annually. King, Sell & Olding, Ltd., 27, Chancery Lane, W. C., London.



From London "Motor"

This is merely prophetic, and is an artist's idea of what might be encountered while crossing the Atlantic in 1909. The automobile shown embedded in the center of the iceberg is supposed to be one of those taking part in the New York-Paris race of 1908.

First Individual: "That must be one of them airy-bated things we've heard tell about."

Second Individual: "Airy-a-ricks you mean. It's that iron roof blown off Mr. Hodge's strawstacks."

36 POPULAR MECHANICS WHITE-OF-SUPPLEMENT

The illustration above shows the perforated tape used by the Telepost for transmitting and the one below shows the electro-chemically printed receiving tape. The clearly defined Morse characters, recorded perfectly at the highest speed of transmission, allow of none of the errors made in transcribing from sound as practiced by the old companies. This insures accuracy. An ordinary typist, with two days' training, can translate these tapes into typewritten messages in half the time a skilled operator can write the message from sound. This means cheapness—25-word telegrams, or 50-word teleposts, or 100-word teletapes for 25 cents, regardless of distance.

T E L E P O S T

WHAT THE "TELEPOST" IS ACCOMPLISHING

A year ago comparatively few people would have understood what anyone was talking about had the word "Telepost" been heard in a casual conversation. Now, however, there is probably not a community in the country reached by Uncle Sam's mails that does not know something definite about this new and really wonderful system of automatic telegraphy that sends messages whizzing over the wires at the speed of a thousand words



Inventor Delany and Chief Engineer Larish reading from a Telepost instrument which has been "slowed down" to a speed to permit reading by sound.

a minute. The Telepost is the perfected result of many years of scientific effort to achieve what electricians regarded as the inevitable outcome of the telegraphic art, the mechanical transmission of messages. Several inventors devised machinery that would automatically transmit messages at high speed, and as early as 1879 one of the systems was put into experimental operation. Unfortunately for those earlier inventions, the electricians were unable to cope with their arch-enemy, the "static" charge of a telegraph wire. Therefore, while the system worked splendidly in favorable weather

conditions, it was "put out of commission" by atmospheric changes, induction currents, and other disturbances, and rendered impracticable. Other automatics were brought forward, but in each instance the "static" interfered so persistently with their operation that continuous service could not be maintained. After these futile experiments electricians in general came to the conclusion that, ideal as automatic telegraphy was in theory, it could not be realized in successful practice. But Mr. Patrick B. Delany, an expert electrical engineer and the inventor of many telegraphic improvements, announced to his friend and associate, Mr. Thomas B. Edison, that he was going after "static," as he believed the problem could be solved by patient effort.

He devoted himself with determined energy to experiments which he hoped would make him master of the principle. He devised new mechanisms and applied new theories to the working out of a system that occupied him for fifteen years before he finally discovered how to deal with "static" (which may be described to the lay mind as the excess electricity with which a wire is saturated, and which must be "cleared" before signals can be sent. It is a very tricky element). In 1903 he obtained from the United States government a basic patent on his invention for the control and use of the "static"—a patent that gives him, and through him the Telepost Company, the exclusive right to the only method by which rapid automatic telegraphy is possible. He succeeded where many earnest and brilliant predecessors failed, for the Delany System of Rapid Automatic Telegraphy, known as the Telepost, has conclusively demonstrated its

reliability and efficiency in every kind of weather, under the most exacting conditions, and sends its one thousand words a minute through when storm influences make hand transmission impossible.

Remarkable as Mr. Delany's achievement is from a scientific view-point, its real importance lies in the fact that it clears the way for the almost inestimable boon of cheap telegraphy. The ability to send telegrams at the rate of one thousand words a minute means that the Telepost can transmit over one wire as many messages as ordinary telegraph companies can transmit over seventeen wires, and with four wires can do all the business that other companies can do with sixty-eight—which is assuming that the methods at present in use permit the sending of sixty words a minute on an average. But as the president and general manager of the principal telegraph company say their average rate is but fifteen words a minute, the Telepost could accomplish with two wires what the hand operated systems obviously would require one hundred and thirty-three wires to perform.

With such a very great economy in the matter of construction, maintenance, etc., the Telepost can operate very profitably with low tolls; and, however gratifying it may be to a public that has long paid the very highest rates in the world, it is not surprising that the Telepost sends messages at the charge of a cent a word, half a cent a word, or one-quarter of a cent a word, according to the character of the message. But even this low rate is minimized by the fact that distance makes no difference in the cost of a Telepost message, the charges being the same between any two points. The saving to business men communicating between New York and Chicago, or St. Louis, or St. Paul, or San Francisco, etc., will be enormous in the course of a year, and they will heartily welcome the extension of a system that offers them such practical benefits.

There are many notable interesting features about the Telepost beside its speed and cheapness. It has, for example, three quite unique services in addition to that of transmitting regular telegrams. One of these is "telecarding," which is sending a postcard by wire. Though this is not done literally, it is in effect thus: The writer fills in a "tele-

card" (the same size as a postcard) and hands it in to the Telepost office (or he can drop it into a postoffice box to be delivered in due form by the letter-carrier), and the Telepost will wire the message to the point of destination or to the nearest Telepost office to that point, where it will be typed onto a similar card addressed to the person for whom it is intended, and delivered through the mails. By this means "telecard" messages could be written in New York and be delivered to an address in Chicago in two hours, instead of in the twenty or thirty hours required to transport a postcard between the two cities. As the "telecard" service carries ten words for ten cents, it will undoubtedly soon be a very popular means of communication in cases where messages are urgent, though not of enough importance in the matter of time to necessitate delivery by special messenger.

Popular appreciation of the Telepost is shown in the desire to secure stock in the enterprise, the whole of Series A and a large proportion of Series B having been subscribed. The remainder of the latter series is going rapidly. In a very little while the company will have several additional sections in operation, and in the next half dozen months, at the present rate of progress, will have enough important territory covered to insure it a profitable commercial business. It will not take many years to extend the Telepost throughout the entire country.

The Telepost has already done enough to give practical significance to the descriptive phrase used a few months ago by a distinguished Congressman in describing it before the House of Congress, as "the telegraph of the future," for it is certainly on the way to a command of the telegraphic field.

The fiscal agents of the company, the Sterling Debenture Corporation, Brunswick Building, Madison Square, New York City, will give full particulars to anyone desiring special information concerning Mr. Delany's system, which represents the greatest advance made in the telegraphic art since the original discoveries of Morse. Write and ask them for their illustrated booklet "No. 356," which contains all the facts, and which will be sent without charge to anyone who is interested in this latest development of improved telegraphy.

THE WONDERFUL EUCALYPTUS

There will probably be something like 200,000 copies of this magazine printed this month, and as this magazine is usually read with more than ordinary interest, there will be more than 200,000 persons read this page. If so, there will be at least 200,000 persons write us during this month for more information about the wonderful Mahogany Eucalyptus Tree. Every single individual who reads this page, will undoubtedly write us for this information, because it means an opportunity of securing a fortune which is probably unparalleled in the history of our country. This fortune will amount to not less than \$40,000.00, and will be absolutely certain, and as safe and secure as anything in this world can be, and can be had by making small monthly payments of \$10.00 each. Is there a single reader of this magazine who will not write immediately and find out more about this wonderful tree which is going to be the greatest wealth-producer the world has ever seen? President Roosevelt, in his last message to Congress, made the following startling statement: "Thanks to our own recklessness in the use of our splendid forests, we have already crossed the verge of a timber famine in this country." Think of it, a timber famine. What will this country do when the wood is gone? We are now using three times as much wood as is being produced. It takes 30,000,000 acres a year to supply the 33,000 establishments which are directly dependent upon the product of the forest for their supply of raw material. No wonder the price of lumber is advancing by leaps and bounds. It has doubled during the past ten years, and will more than double within the next ten years. Mahogany Eucalyptus is the most beautiful wood known. It is used for piano cases, fine cabinet work, exterior finish, etc. The average tree ten years old is 92 ft. high and 11 in. in diameter, making 71½ board feet of lumber. This lumber is worth \$140.00 per thousand. Each ten-year-old tree will therefore contain \$10.00 worth of lumber at pres-

ent prices. We will sell you the land; plant and care for 4,000 such trees, which will give you \$40,000.00 worth of lumber, and you can pay for these at the rate of \$10.00 per month. Twice as many trees and twice as much land will cost you \$20.00 per month. Let us tell you more about these wonderful trees. It is the most interesting story you have ever read. When you have learned more about this grand new industry, you will admit that the rapidity with which these trees can transform themselves into a regular, constant, perpetual source of wealth for you is almost unparalleled. We will be disappointed if a single person who reads this page should fail to ask us for our little booklet. Address: The Sacramento Valley Improvement Company, 1003 Liggett Building, St. Louis, Mo.

AN IDEAL INVESTMENT.

A Eucalyptus grove makes an ideal investment. The trees grow night and day, year in and year out. Nature is perpetually creating wealth for you; your profits never stop. Other crops require attention—watchful, faithful attention—not so with Eucalyptus. There are no seasons, no seed time nor harvest, no wages to pay, no help to hire. Neglecting a harvest only adds to the value of your crop when cut. You can always wait if you want to; the longer you wait the more money you get. Every day adds to the value of your estate. Every day these remarkable trees are accumulating wealth for you. Such an income is more certain than any form of rent or interest. It is a permanent, steady, inevitable, perpetual income, subject to no uncertainty whatever. Your trees simply keep getting larger and larger, taller and taller. They have no business but to grow, they never rest and seldom die.

An ordinary telegraph pole of native American wood requires sixty years to grow. A Eucalyptus tree will grow a better, more substantial pole in ten years. There are over 40,000,000 poles in use; about 3,000,000 are required annually for renewals. The prices being paid for poles at present by the Pacific Electric Company of Los Angeles is as follows:

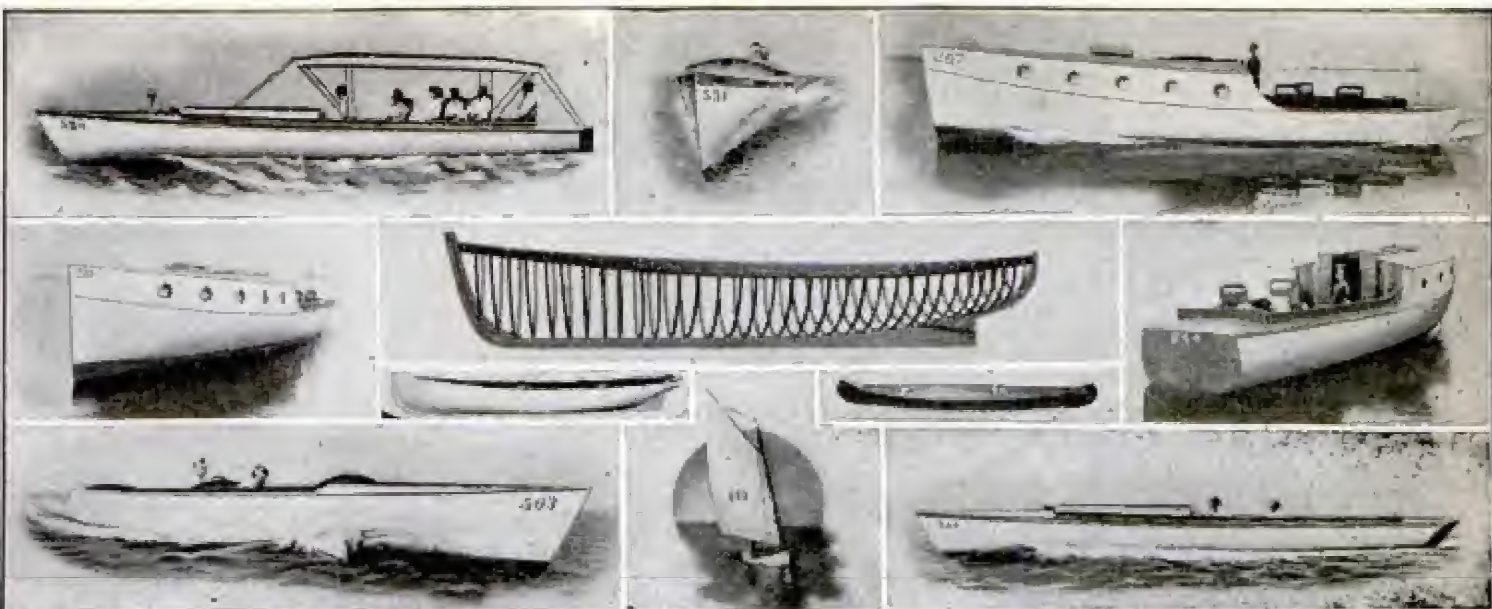
35-foot poles	\$ 6.00
40-foot poles	7.00
45-foot poles	8.00
50-foot poles	9.25
55-foot poles	11.75
60-foot poles	12.50

As the supply diminishes and the demand increases, the price will naturally increase; but assuming that the present price will remain in force and that only 500 serviceable poles will be found on an acre at the end of ten years, we shall have 500 poles at \$6.00, or \$3,000.00 per acre.

If you will agree to pay us \$10.00 per month for 100 months we will agree to deliver to you a five-acre Eucalyptus grove. We will agree that the soil shall be equal to any, anywhere, for the purpose, climate conditions ideal, transportation facilities unsurpassed, our plantations being right on the Southern Pacific Railroad a few miles from Sacramento. We agree to plant this grove for you and care for it for a period of ten years.

Is this proposition worth consideration? Is there any other way in which you can create an estate of this magnitude in this length of time? Remember that this information is based upon fact, not theory; that the facts are solid, hard, indisputable, undeniable facts which can be substantiated and which will stand the scrutiny of any test which you care to make.

Address Sacramento Valley Imp. Co., 1003 Liggett Bldg., St. Louis, Mo.



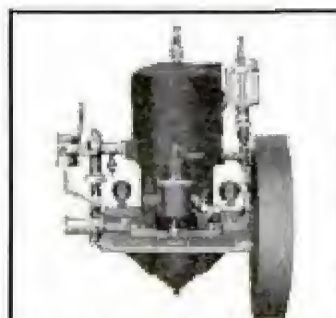
Build Your Own Boat and Save Two-Thirds

Anyone can put together my knock-down boats or build a boat from rough lumber, by using my exact size printed paper patterns and illustrated instruction sheets. I can sell you a boat for about one-third what a factory would charge. If you want to know how it can be done,

Send for my new 1909 catalog No. 22 today, showing 100 new models.

Each one embracing all the requirements of the thoroughly up-to-date pleasure boat—the result of twenty-three years' experience in building and sailing boats—from a paddling canoe to a large cruiser.

Eight years ago I originated the pattern and knock-down system of boat-building. It has revolutionized the boat-building business. Boats built by my system are now found in every civilized corner of the earth, and they have been built by amateurs at a saving of just two-thirds of what they would have cost if bought from a boat builder or factory. Right today there are more boats built by my system than in all the boat factories put together, and mostly by inexperienced men and boys.



My engines are best described in catalog No. 22, which also gives a combination discount when your order includes engine and K.-D. frame.

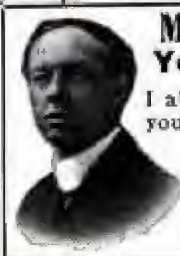
My new catalog quotes prices on knock-down frames, patterns, complete knock-down boats, motors, hardware and fittings, knock-down boathouses and completed boats ready to run.

In addition to our former lines, it shows speed, semi-speed, and family launches, of the "V-in," "V-out" and "V-plumb" stern types. Also a line of sea-going cruisers and light draught tunnel sterns, up to 45 ft. in length, beams up to 9 ft.

I can supply you with the frame-work for your boat, shaped and machined, every piece fitted ready to put together, for less money than most lumber dealers would charge you for suitable rough lumber.

I can save you (1), the boat builders' profit; (2), labor expense; (3), big selling expense; (4), $\frac{3}{8}$ the freight.

Figure it out yourself



MY GUARANTEE: You Take No Risk

I absolutely guarantee that you will be perfectly satisfied with everything you purchase of me, or your money will be instantly refunded.

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Put the "Knock-Down" Sections Together Yourself and Save $\frac{2}{3}$

I can also save you two-thirds on high grade Mission furniture shipped in sections—not in pieces. Easy to put together. No tool work necessary. No skill required. Simply fit the assembled sections together in the grooves provided, apply stain furnished and the piece is finished.

Every piece is of selected solid oak, massive, simple, and always in good taste, increasing in value with age, of a style that never changes. You save in dealer's profits, freight rates, finishing, crating, packing and factory costs.



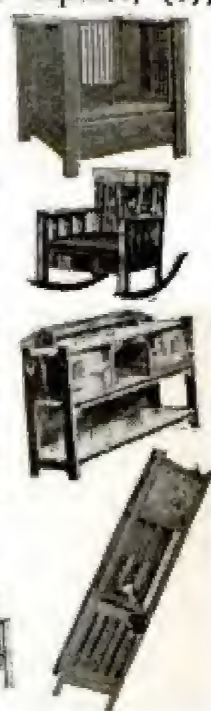
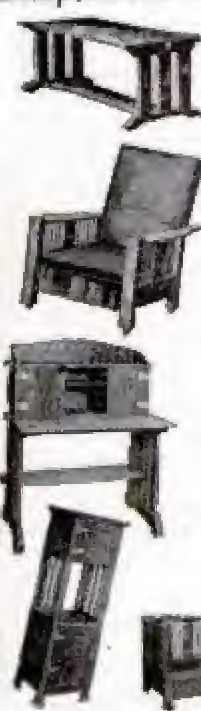
As you receive it, with cushions made ready to drop in place. Just six joints to put together.

If interested in furniture only, send for Catalogue No. 8

C. C. BROOKS, PRESIDENT BROOKS MANUFACTURING COMPANY

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Established 1901





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Envy the boss or the men who are in touch with him *will not bring you promotion*. You must have ambition backed by the *training* that brings you under the chief's notice—that makes you a *factor* in the business rather than a mere worker.

You can easily acquire such a training. Other poorly-paid but ambitious men have overcome greater obstacles than those which beset you, and have reached well-paid positions through the help of the International Correspondence Schools of Scranton. The attached coupon will bring you a complete solution to the problem. Mark it. Doing so places you under no obligation to go to any expense.

Think of the greatest *practical* training institution in the world *going to you*, no matter where you live, and training you in *your spare time*, without requiring

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I enrolled for my I. C. S. Course when employed as a telegrapher. I am still holding a position at the same occupation, but my salary has been increased \$25.00 per month since I started my Course.

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441 Brook St., Galesburg, Ill.

While employed as a machinist I enrolled for my Course in the I. C. S. After devoting some time to study under your direction I secured a position as Detail Designer. I am now a Mechanical Draftsman and have tripled my salary since enrolling.

CHAS. H. ROCHEFORT,
1135 E. Dunning Street,
Jackson, Mich.

When I enrolled in your Schools I was employed as a shop hand for the Pennsylvania Railroad Company. I am at present employed as a Draftsman for the master carpenter. My earnings have been increased \$20 per month. I think very highly of your Institution.

HERBERT A. LANDIS,
P. O. Box 25, Altoona, Pa.

To a very large extent my I. C. S. Course is responsible for my advancement from a position as lineman to Chief Inspector of the Tri-State Telegraph and Telephone Company. I am now earning \$25 a month more than I did when I enrolled.

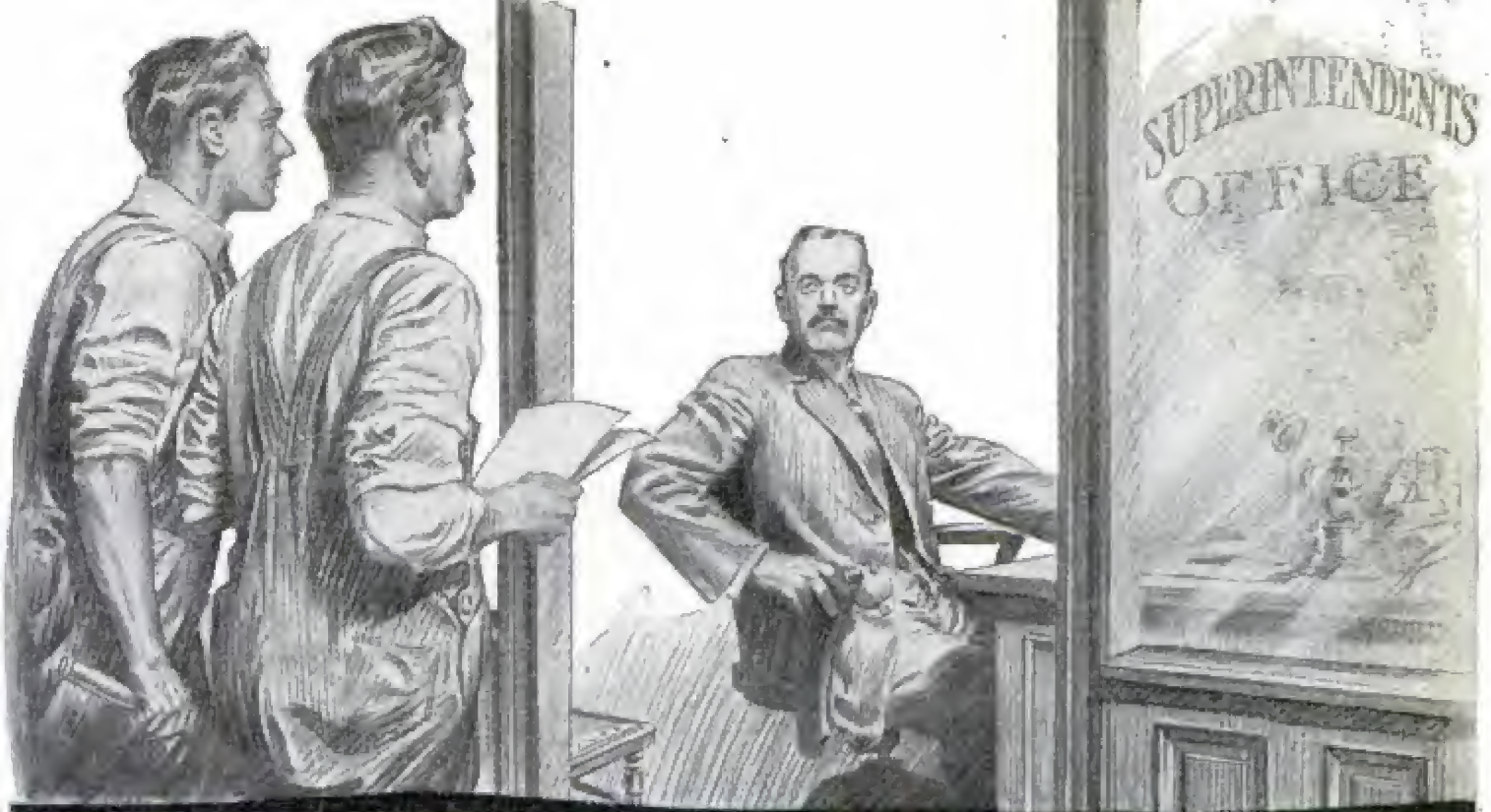
CLIFTON O. BONHAM,
663 Hague Ave., St. Paul, Minn.

I was a laborer when I enrolled for my I. C. S. Course. I then secured a position as helper for the engineer at Butler Bros., and secured an increase in salary of over 100 per cent. The knowledge gained from my Course is responsible for my advancement and I would recommend the I. C. S. to any ambitious man.

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When working as a loom fixer at Racine, Wis., I enrolled for an I. C. S. Course. My previous education was quite limited. I am now Boss Weaver at the La Porte Woolen Mills and have materially increased my earnings.

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you to leave home, stop work, or to buy so much as a single book. **Yet that is exactly what the I. C. S. will do.** There is no hurry, no keeping step with other students, no loss of time. I. C. S. instruction is *individual* as well as practical. It gets right at your weak points and quickly puts you in a position to command a good salary *at the occupation of your own choice.*

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Brings Success

The instruction afforded by the I. C. S. is a great blessing to those who are denied the privileges of a college education. I enrolled for a Course when I was employed as a wire chief. I am now Manager employed by the Atchison, Topeka and Santa Fe Railroad Co. at Albuquerque, and have increased my earnings \$25 per month.

A. E. DOUGLAS,
701 S. Walter St., Albuquerque, N. M.

My Course in the International Correspondence Schools of Scranton, Pa., is very largely responsible for my advancement from a position as wiper to that of Train Rule Instructor and in increasing my salary \$75 per month more than it was when I enrolled.

J. R. TREPANIER,
136 Queen Street, Quebec

I was working as an overseer of weaving when I enrolled for my I. C. S. Course. I am now Superintendent and Designer and my salary has been very materially increased. Much valuable information can be gathered from your Course and I consider the teaching staff competent and very obliging.

CHAS. T. WILKINS,
Stratford, Ont.

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Telephone Engineer
Elec. Lighting Supt.
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Mechano-Therapy is the art, or science, of treating disease without drugs. It is similar to Osteopathy, but far superior, being the latest, up-to-date method of treating disease by the Natural Method. It heals as Nature heals—in accordance with Nature's laws.

The Mechano-Therapist is a drugless physician and a bloodless surgeon. His medicines are not drugs, but scientific combinations of food, circumstance, idea, water and motion.

The Mechano-Therapist is skilled in compelling the body TO DO ITS OWN HEALING with its own force, rather than with poisonous drugs of the old school practitioner.

CAN I LEARN IT?

Have you asked yourself this question? We answer, unhesitatingly, YES.

If you have so much as an ordinary, common school education, you can learn.

If you have the ambition to better your condition—to earn more money—to have more leisure—you can learn.

Nor does this require years of patient study to learn Mechano-Therapy—we can teach you in a very short time, so that you may enter this profession—and when you do, you begin to make money. No text books are required, beyond those furnished by us. We supply all lessons and necessary text books free of cost to you. No apparatus is used. You do not even need a place to work. All you require is your two hands.

Read What Our Graduates Say

The statements of a few of our graduates below verify every claim we make. Read them carefully, and remember that what these men and women have done, you may do. The success they have made, you may make. We do not give the address of the people whose testimonials we print. Our graduates are meeting with remarkable financial success, and shrink from having their prosperity published broadcast. If you wish to communicate with any whose names are given below, write us and we will supply you with the address.

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Dr. Ellsworth says: I have all I can do, and at very good fees, and am at present treating an M. D. for Diabetes. It is impossible for me to speak in befitting terms of the wonderful success of Mechano-Therapy in the treatment of disease.

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Dr. Slagle says: Mechano-Therapy is one of the cleanest, best paying, up-to-date professions. One that is remunerative from the start—one that is practical in every way—one that is not built on theory—one that is progressive—one that will make you prosperous while you are making others well and happy.

A Personal Word

From the President of the College.

Have you ever thought of going into business for yourself?

Then send for my FREE book. It will tell you how others are enjoying a life of luxury, while putting money away in the bank. How YOU can not only gain independence, but be a benefit to humanity and a highly respected citizen with an income of \$3,000 to \$5,000 a year.

All I ask is that you send me the coupon below for my FREE book. You can then decide, in the privacy of your own home whether you wish to embrace the opportunity which I offer you, or whether you will continue to plod along the balance of your days slaving for others.

We Teach You in Your Own Home

We can teach you an honorable and profitable profession in a few months, which will insure your financial independence for life. We can make you master of your own time—to come and go as you will—an honored and respected citizen, with an income of \$3,000 to \$5,000 a year. We teach you this pleasant, profitable profession by mail, right in your own home, at your own convenience, and without interfering with your present duties. It makes no difference how old you are, any person—man or woman—with just an ordinary common school education, can learn Mechano-Therapy. It is easy to learn and results are sure.

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This machine supplies a public want. It prints and delivers twelve calling or business cards for 5 cents. Can be operated by any man, woman, or child. Everybody that sees it drops in a nickel. It is positively the best automatic machine made. It gathers in the coin.

Charles B. Lake, Providence, R. I., writes: "My machine took in over \$25.00 last week."

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An automatic device which calls out in a clear tone the weight of the person standing on the machine, after placing a coin in the slot. It is a nickel-eater that never fails to attract the crowd. Just read the amounts being made: Dreamland Moving Picture Theatre, Cleveland, Ohio, \$35.20 from one scale in two weeks. L. J. Denkler, Macon, Ga., \$120.00 from three scales in 10 days. H. S. Donnerd, Indianapolis, Ind., \$24.36 from one scale in one day. What others are doing you can do—so don't delay, but fill in and mail the attached coupon today before someone else gets into your territory. We are the leading house in the United States for all kinds of Automatic Weighing Machines and Automatic Vending Devices.

Our Automatic Peanut Machines

are positive winners, over one thousand Peanut Machines being operated in Cleveland, Ohio, alone. This demonstrates that the business is profitable.

Champion Gum Vending Machines

have been adopted by nearly every railroad in the country, including Illinois Central, Southern Pacific, Baltimore & Ohio, etc.

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It makes no difference where you live or what business you are engaged in, you can positively increase your present income by handling our machines. They require very little attention—just fill the machine and take out the money. Every machine is fully guaranteed and with ordinary care will last a lifetime. They are just the thing for men with small capital, because they bring quick returns and large profits. \$5.00 to \$50.00 a day easily made. Better fill in the coupon NOW. Tell us what machine you are interested in and we will show you how you can invest your savings where they will make money for you day and night. While you sleep they are working for you. You cannot make any mistake, for we are headquarters for Automatic Machines of all kinds. We operate our own machines in Cleveland, Ohio, and know what they will do.

The United Vending Machine Co.

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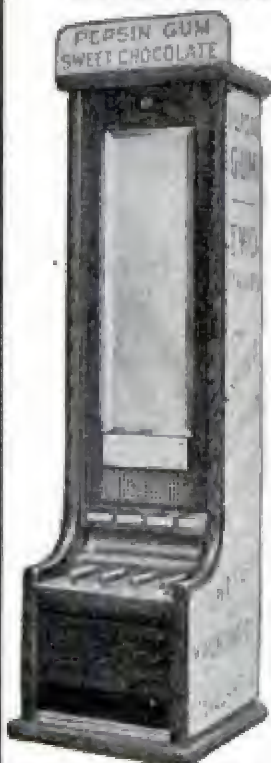
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PRINTING MACHINE



MACHINE FOR VENDING
SALTED PEANUTS



TALKING SCALE
IT SPEAKS YOUR WEIGHT



CHAMPION GUM AND CHOCOLATE
VENDING MACHINE

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THE
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MACHINE CO.,
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Gentlemen:—Kindly
send me information regard-
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I am interested in.....

Name.....

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State.....



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Keep The Tank Throw Away The Tower

THAT'S what you do when you install a Kewanee System of Water Supply!

The Kewanee Pneumatic Tank is buried in the ground or located in the cellar—there is no elevated or attic tank to freeze, over-flow, leak or collapse—and the water is delivered by air pressure evenly and abundantly to all fixtures. Temperate in winter and cool in summer.

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Over nine thousand Kewanee Systems in successful operation supplying water for country and suburban residences, clubs, farms, schools, public and private institutions, villages, etc. The Kewanee System is **not an imitation—is not a substitute**. It is the **original** water supply system involving the use of **air pressure** instead of gravity pressure. Avoid cheap imitations. Look for our trade mark and name plates on tanks and pumping machinery. Get the genuine and you will take no chances—we guarantee that.

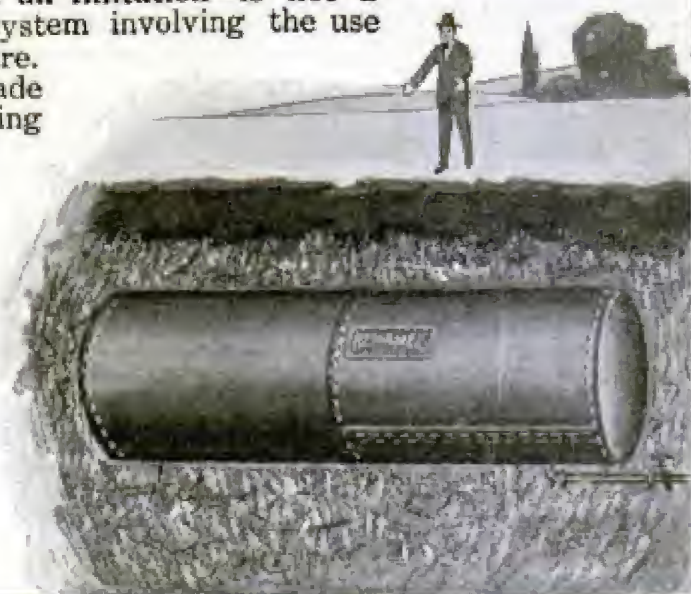
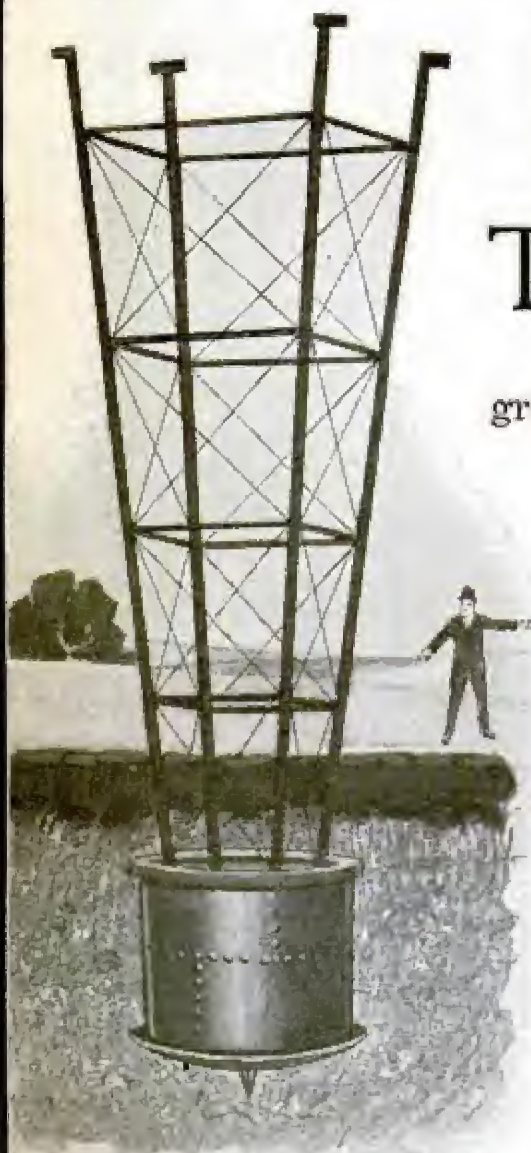
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Kewanee Water Supply Co., Kewanee, Ill.

1212 Marquette Bldg., Chicago, Ill.

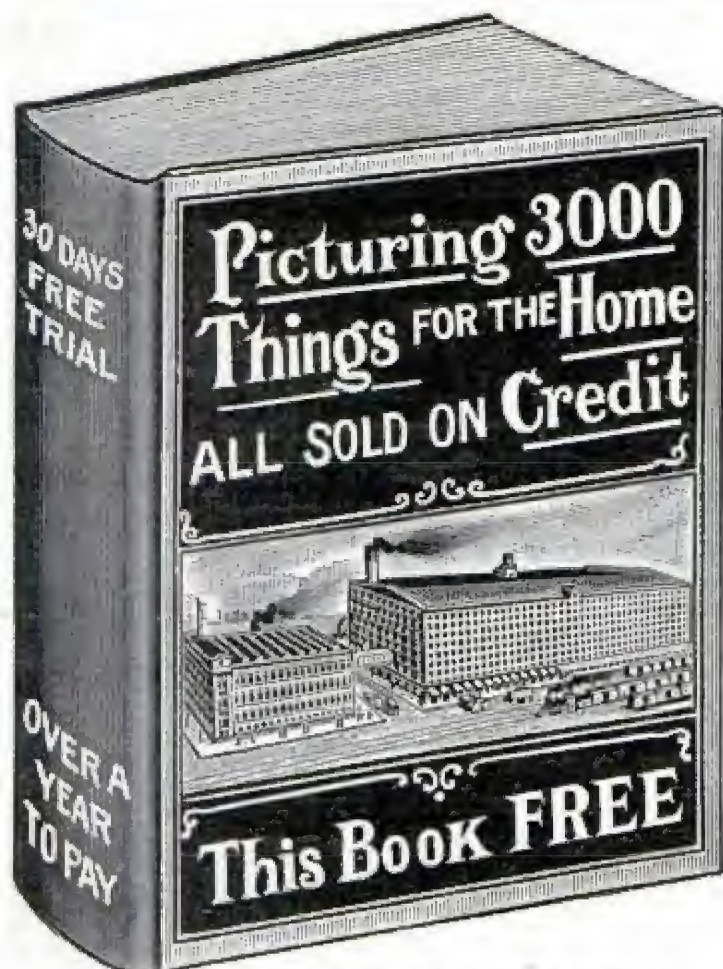
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\$2.00 a Day From Poultry and Eggs

IS THE name of a new book by the author of "200 Eggs a Year per Hen," the most popular poultry book ever printed. "**\$2.00 a Day from Poultry and Eggs**" deals with the business side of poultry keeping, as the other dealt with egg production. It



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The book tells how to make a start, what breeds pay, how, when and where to buy a farm, how to make a living from the first, describes the most wonderful brooding system in the world, tells how to build the most economical poultry houses, how to feed for best results, describes a feed that can be made for 15 cents a bushel and is without a peer for producing

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Invaluable to every man who wishes to make money on the side, and indispensable to the man who is looking forward to the free, independent, healthful life of the poultry farm. Ninety-six pages, illustrated.

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Last spring Mr. T. N. Smith, 348 Mount Hope Street, Attleboro Falls, Mass., hatched and sold 35,000 R. I. red chicks. The most of them he sold for 15 cents each, but some of the choicest for 25 cents. This is but one item. Mr. Smith also raises and sells breeding birds, exhibition poultry, laying stock, etc., and this year expects to do a business of \$11,000. Five years ago Mr. Smith was a motorman on an electric road, earning when he made full time \$16.28 a week. He built up his poultry business in spare hours. It is increasing all the time, and there is no reason why when he is fifty years old he will not be worth \$50,000. Had he been content to remain a motorman he still would be earning when he reached fifty \$16.28 a week, provided he made full time.

The story of Mr. Smith's remarkable success is told in his own words in our new book, "**\$2.00 a Day from Poultry and Eggs**." There is no reason why his success could not be duplicated in hundreds of instances. The story of Mr. Smith is only one feature out of scores of value and interest. Price of book, 50 cents, or with the **AMERICAN POULTRY ADVOCATE** one year 75 cents. Two yearly subscriptions and book for \$1.00 or given as a premium for two yearly subscriptions at 50 cents each. Address

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Let us send the
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WE WANT a sample of wood finishing done with our preparations in your home. We will send the materials to do the work. Here they are:

A bottle of Johnson's Electric Solvo to quickly remove the old finish—

A bottle of Johnson's Wood Dye (you to choose the color from our 14 different shades) to color the wood—

A sample of Johnson's Prepared Wax to give that

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And our illustrated guide book for home beautifying which includes complete color card and tells how to finish and refinish wood.

No doubt you have some piece of furniture that you prize highly, yet do not use on account of the worn condition of its finish, or because it does not harmonize with other furniture or decorations.

Use this outfit, which we want to send you free, for refinishing it, and you will be surprised to learn how easily the work is done and the beauty of the result.

May we send you these three packages, and the valuable six-color book, free at once? Learn from the test the beautiful effect obtained from the use of

Johnson's Wood Dye

It is not a mere stain. It is a deep seated dye—sinking into the pores of the wood and bringing out the beauty of the grain. When finished with Johnson's Prepared Wax you have a permanent finish of real beauty and most artistic effect. We want to give you these three packages at once. Send ten cents to partially pay cost of packing and postage—using coupon below for your convenience.

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| No. 140 Manila Oak | No. 121 Moss Green |
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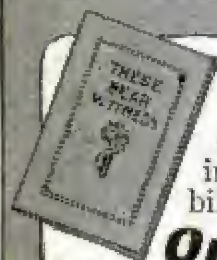
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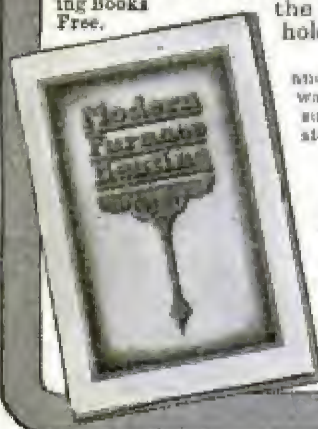
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It is the only really Sanitary Horse Cleaning Device on the Market

Removes every particle of dust, loose hair, dandruff or scurf. Opens the pores. Prevents disease. Does the work in one tenth the time.

ADVANTAGES

This apparatus possesses the following unique advantages:

It removes all the dirt on the animal's skin, cleansing both the surface and the pores and creating a perfectly clean and sanitary condition.

It improves the animal's health by opening and thoroughly cleaning the pores of its

Enables the owner of horses to obtain better results at a smaller cost.

It is easy to manipulate. Takes but a few minutes to acquaint your help with the handling of this apparatus.

Has connections for from 1 to 4 tubes enabling the cleaning of 4 horses at the same time. Tubing can be led to any part of the stable.

skin and removes all microbes of disease.

It cures skin diseases by removing their cause.

It is thoroughly hygienic and sanitary.

Not only is the animal's coat cleaned more perfectly than by any means heretofore known, but the particles removed are conveyed to a closed receptacle instead of being scattered and disseminated around the stable. Produces a perfectly sanitary and healthful condition in the surroundings.

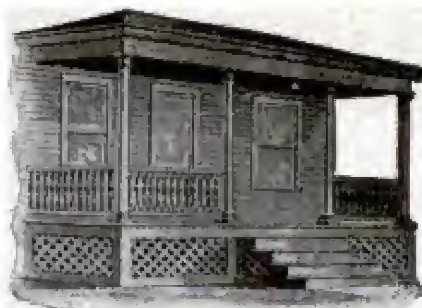
DOES THE WORK IN ONE-TENTH THE TIME

A horse can be thoroughly cleaned in from three to five minutes by this improved apparatus while with the present currycomb and brush it takes from twenty minutes to an hour of vigorous rubbing and then it is not thoroughly cleaned and if the workman is lazy or tired the horse is only superficially brushed and curried to brighten up his skin.

For further particulars and Prices write

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for all styles of
Porches at
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**Our Stair Department
will save you from \$60
to \$125 on
every job.**



**Gable Ornament
Price 75c.**



Oak Stairs, Complete, \$28.59.

Millwork for this Porch, \$23.38.

Old Houses Made New at Small Cost!

**Write for Grand Free Millwork Catalog
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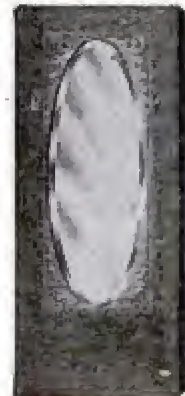
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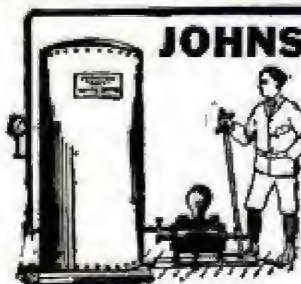
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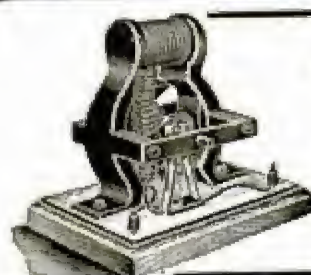
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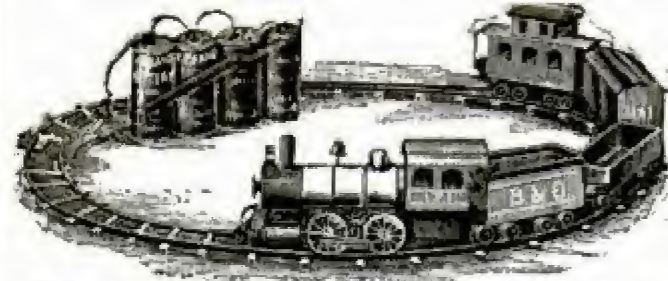
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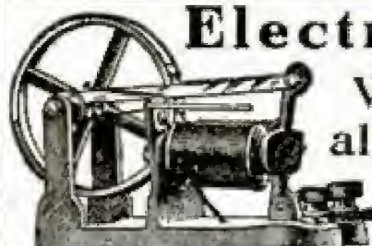


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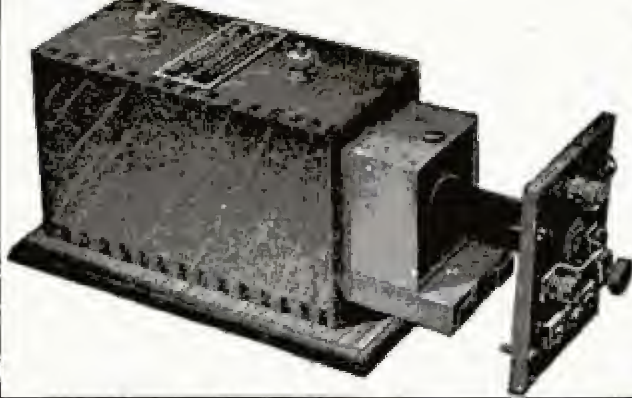
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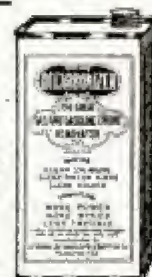
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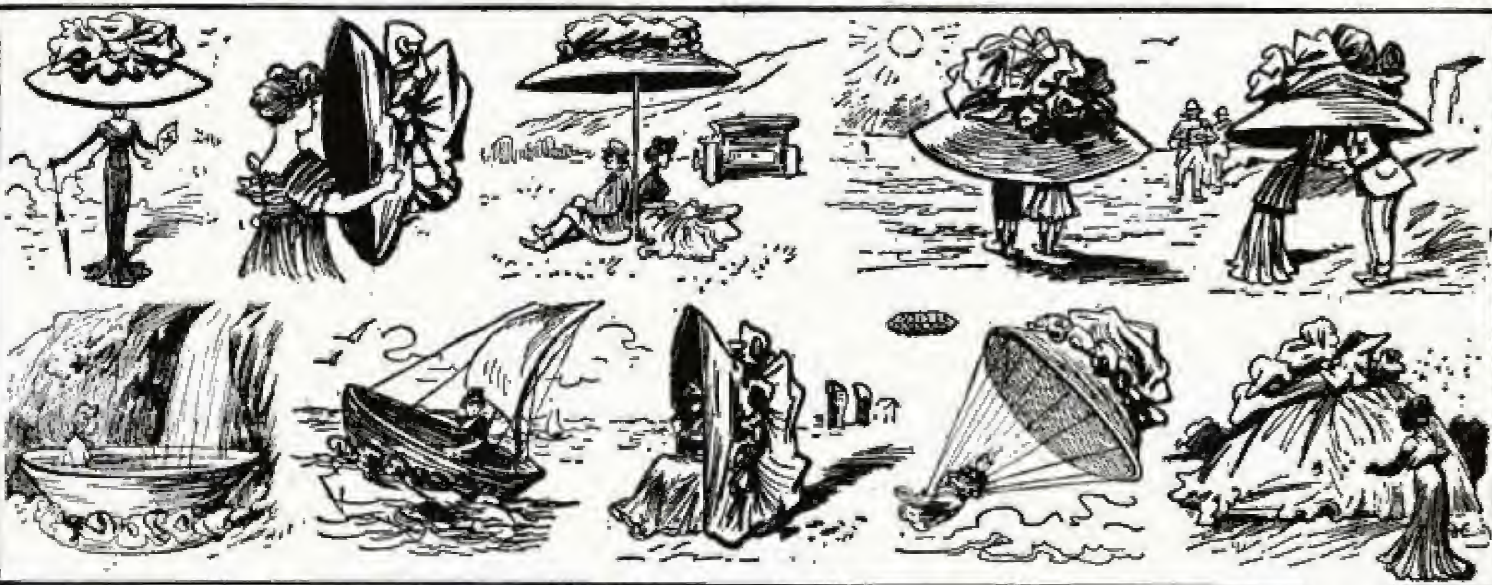
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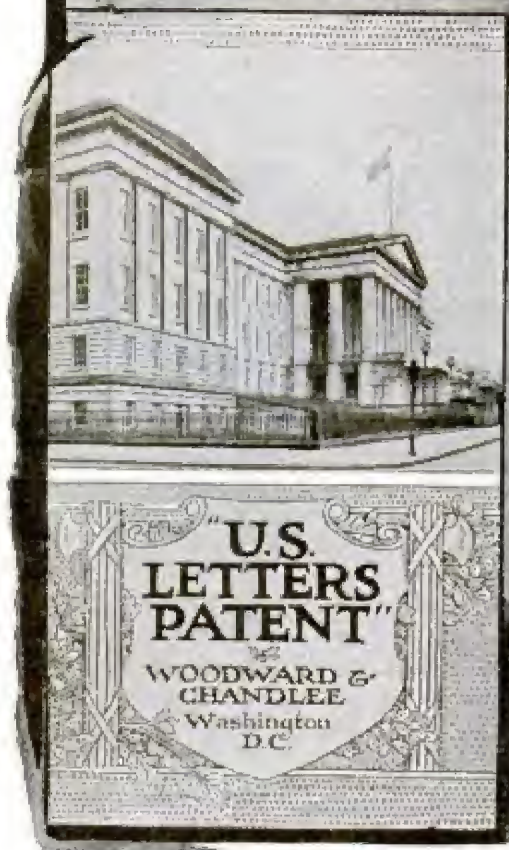
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Mr. Parker on November 1, 1903, after having been a member of the Examining Corps of the U. S. Patent Office for over five years, resigned his position as examiner to take up the practice of patent law.

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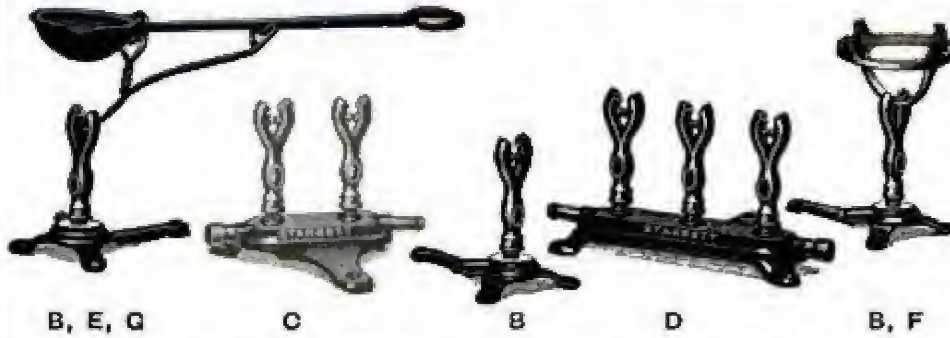
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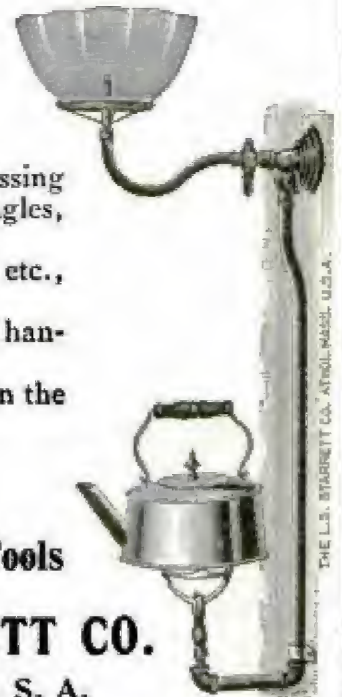
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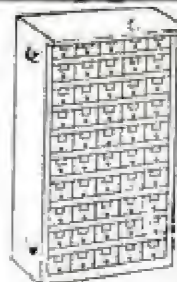
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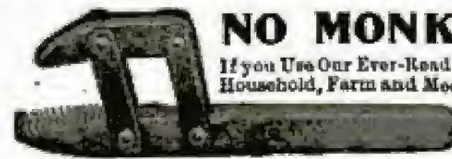
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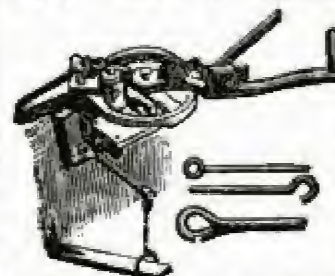
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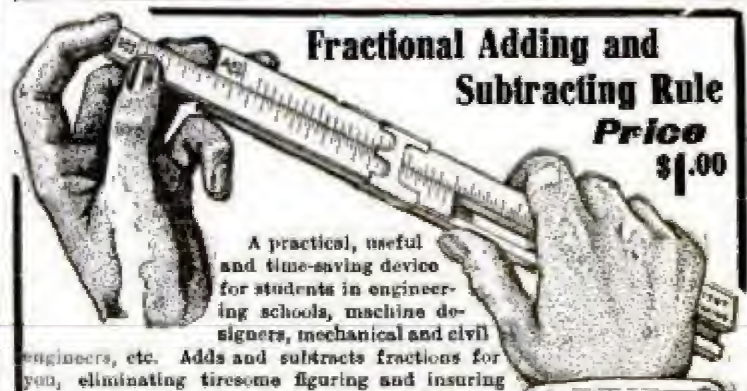
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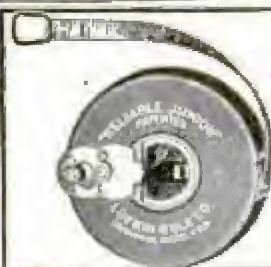
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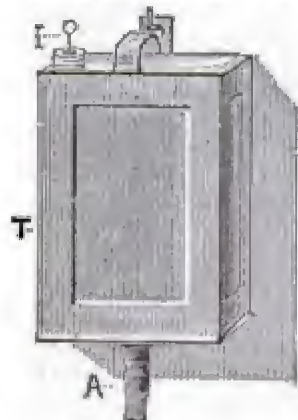
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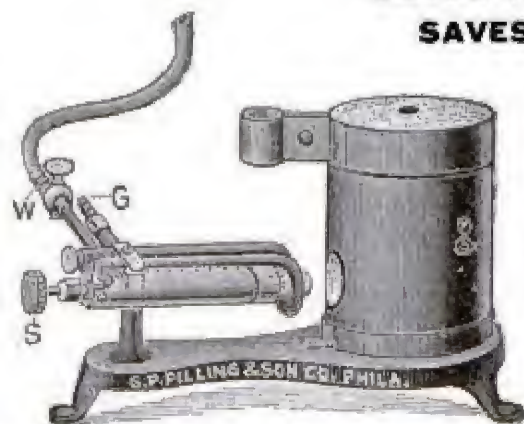


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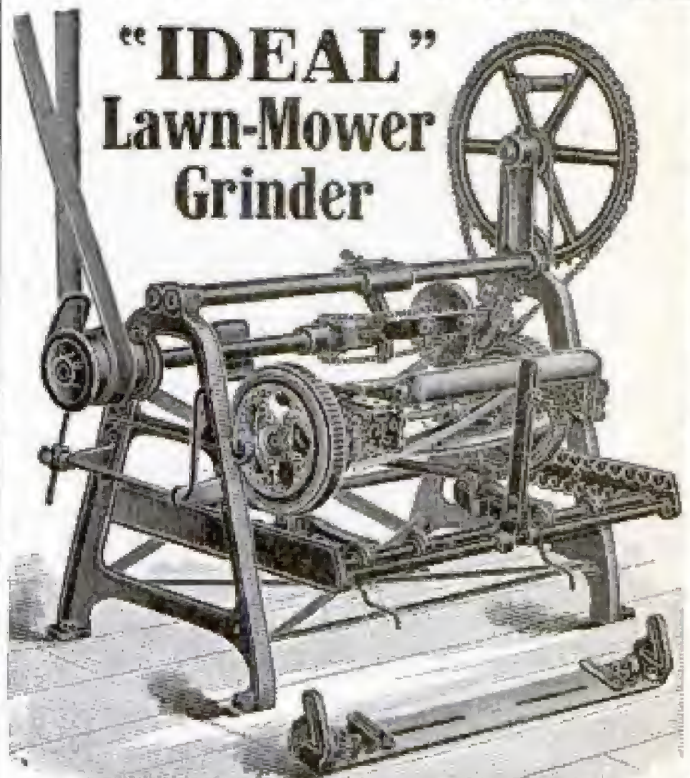


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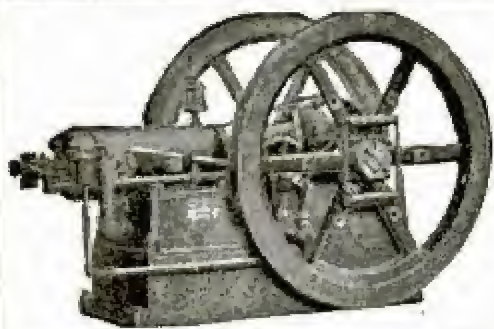
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"Mr. Colfax, I want you to take a message for me to the miners whom you visit. I have very large ideas of the mineral wealth of our nation. I believe it practically inexhaustible. It abounds all over the western country, from the Rocky Mountains to the Pacific, and its development has scarcely commenced. During the war, when we were adding a couple of millions of dollars every day to our national debt, I did not care about encouraging the increase in the volume of our precious metals. We had the country to save first. But now that the rebellion is overthrown, and we know pretty nearly the amount of our national debt, the more gold and silver we mine, we make the payment of that debt so much easier. Now," said he, speaking with more emphasis, "I am going to encourage that in every possible way. We shall have hundreds of thousands of disbanded soldiers, and many have feared that their return home in such great numbers might paralyze industry, by furnishing, suddenly, a greater supply of labor than there will be demand for. I am going to try to attract them to the hidden wealth of our mountain ranges, where there is room enough for all. Immi-

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ration, which even the war has not stopped, will land upon our shores hundreds of thousands more per year from overcrowded Europe. I intend to point them to the gold and silver that wait for them in the West. Tell the miners for me, that I shall promote their interests to the utmost of my ability, because their prosperity is the prosperity of the nation; and," said he, his eye kindling with enthusiasm, "we shall prove, in a very few years, that we are indeed the treasury of the world."

This address was made on the morning of Friday, April 14, 1865, the very day of his assassination, so that his dying official utterance was a message to the miners.—Mining Science.

H. P.

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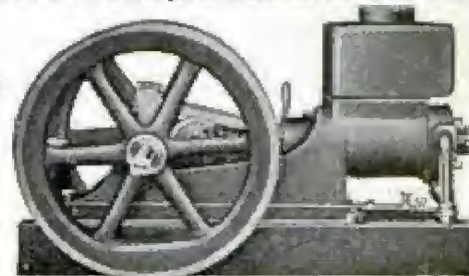
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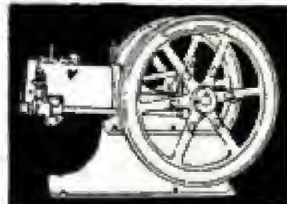
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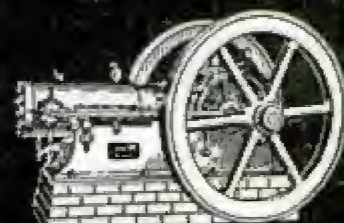


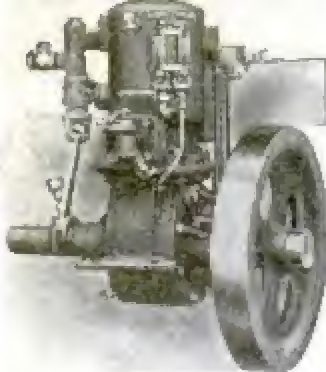
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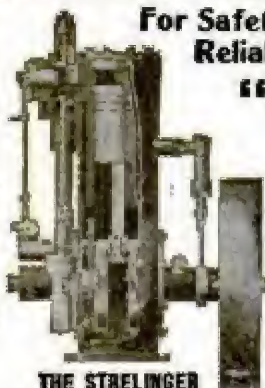


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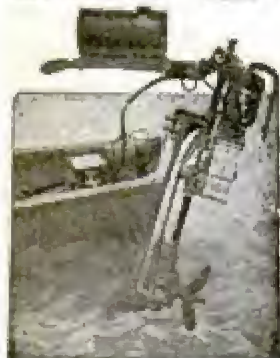
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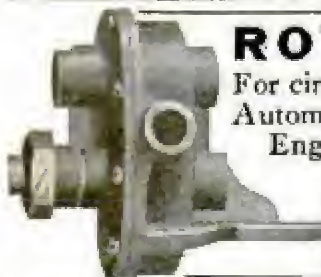
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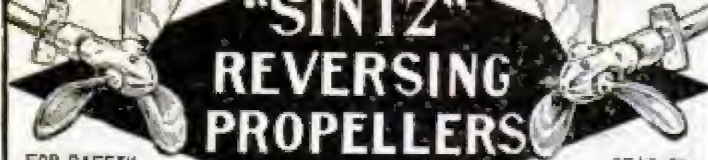
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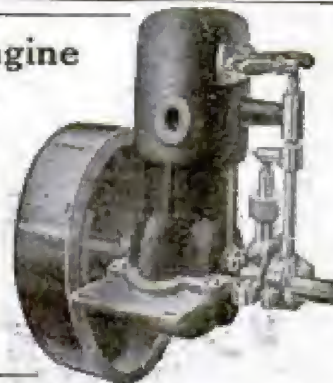
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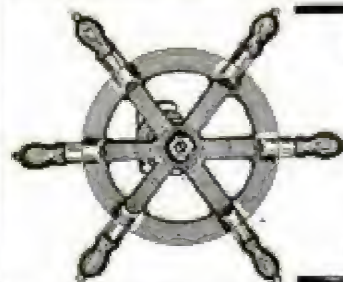
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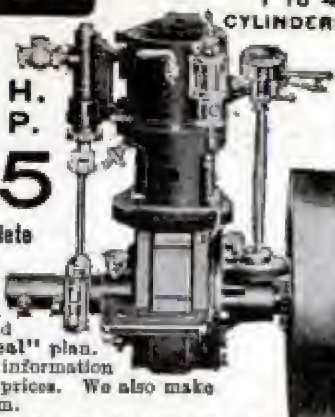
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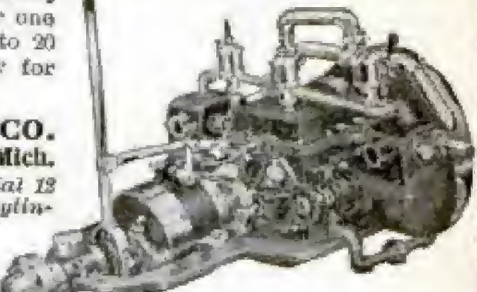
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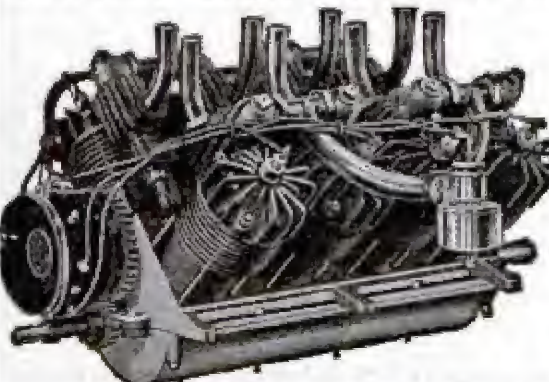
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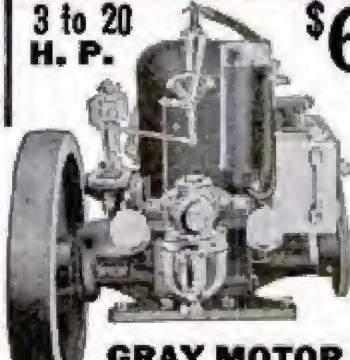
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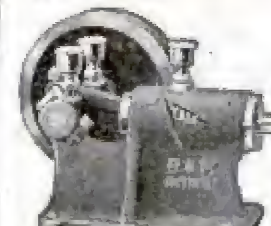
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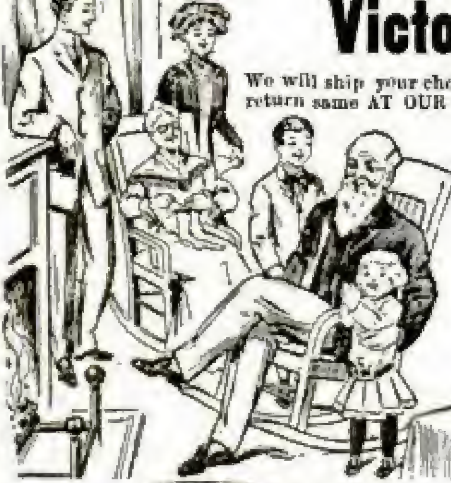
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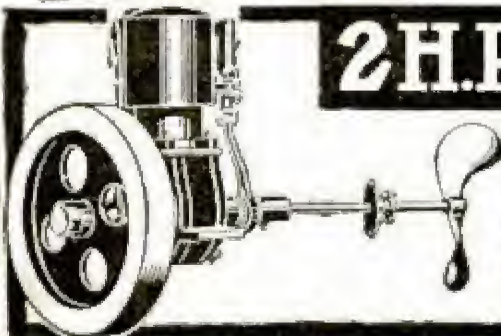
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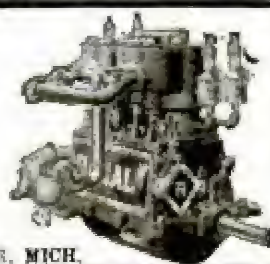
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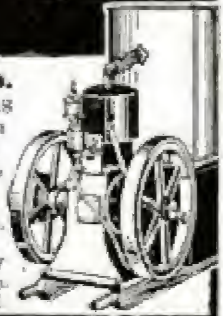
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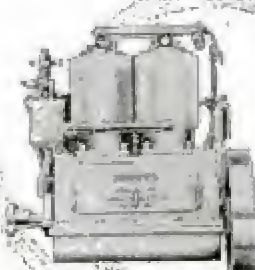
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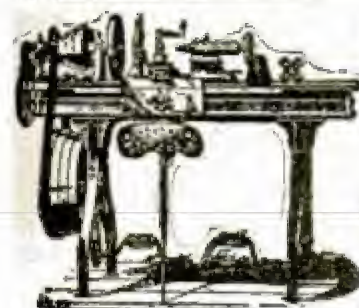
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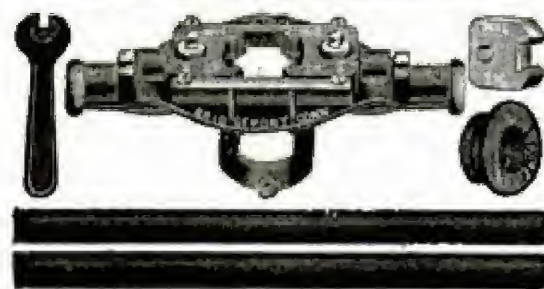


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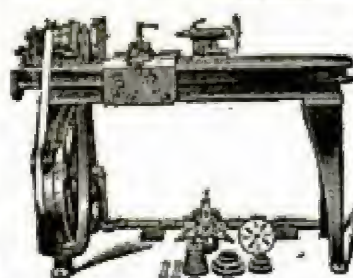
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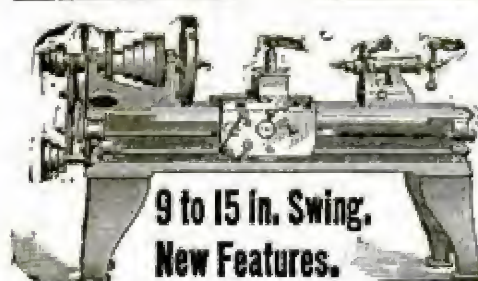
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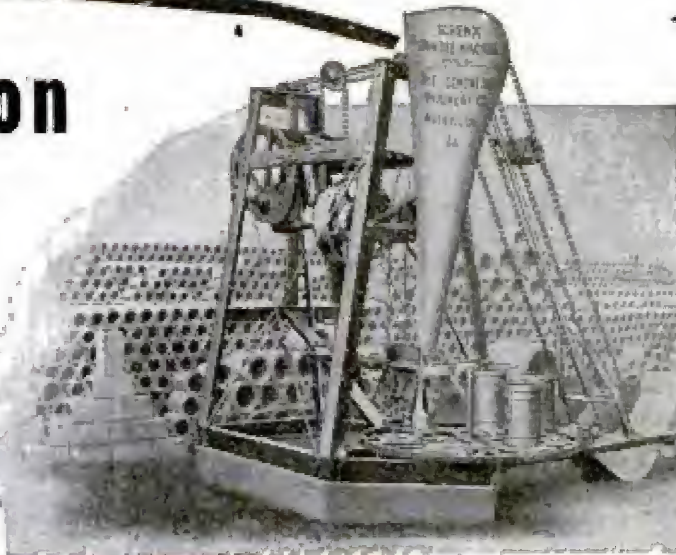
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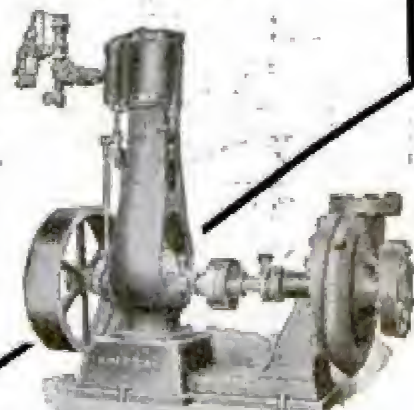
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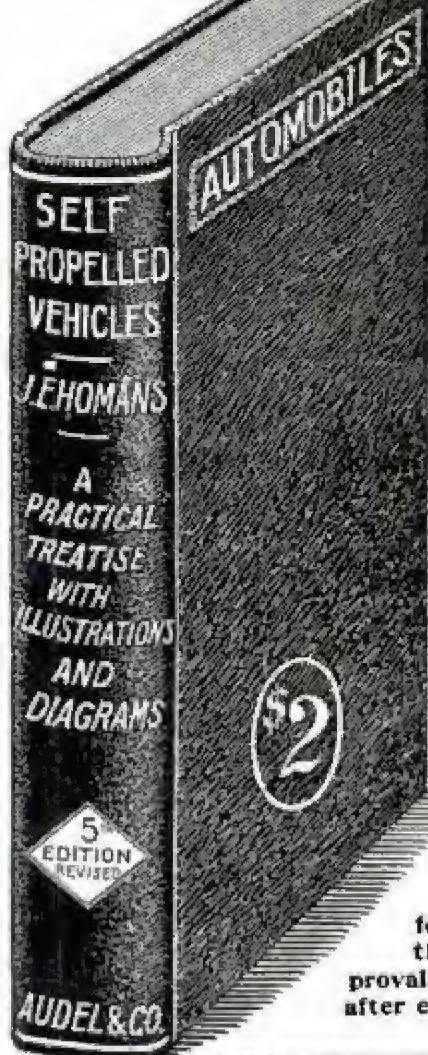
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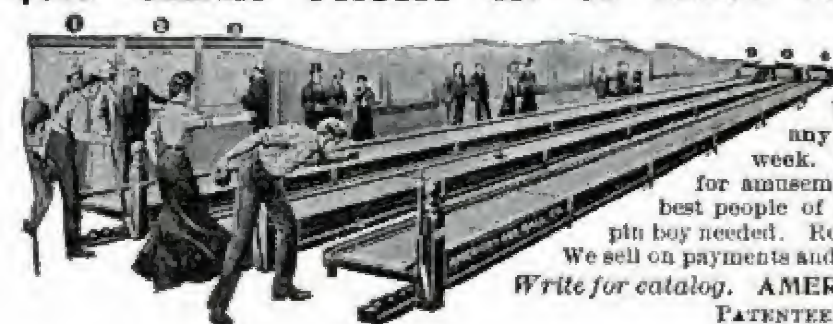
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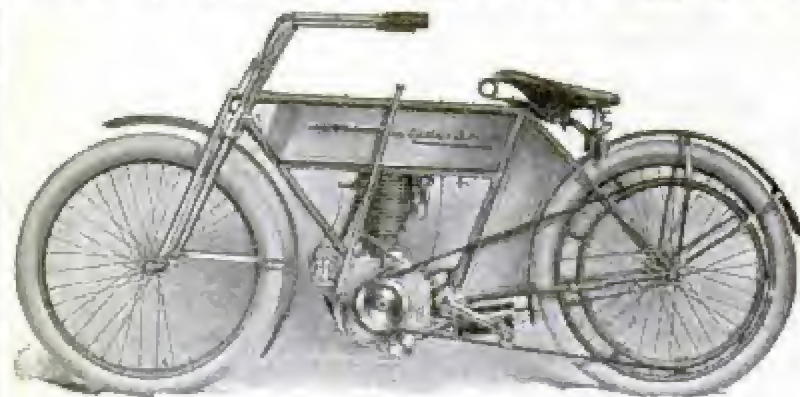
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An American betterment of the finest foreign models.

Easy running, powerful, reliable, swift. Its equal at the price does not exist today.

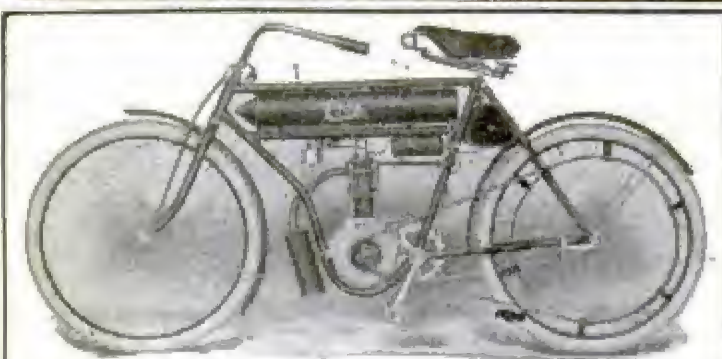
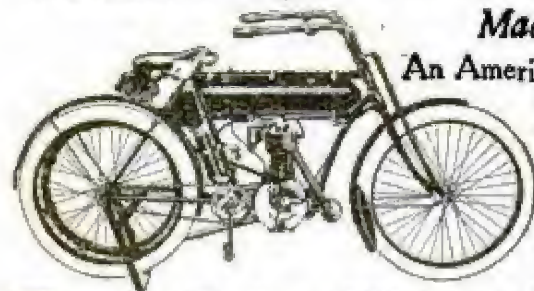
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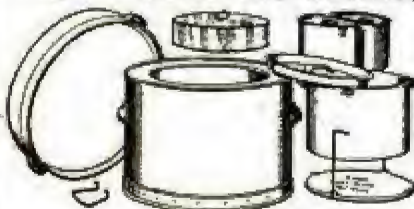
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"Bright, Soft, Easy on the eyes,"

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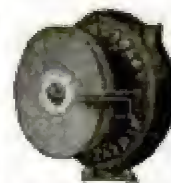
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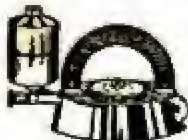


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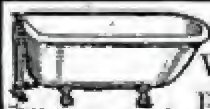
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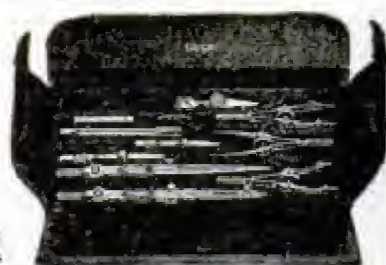
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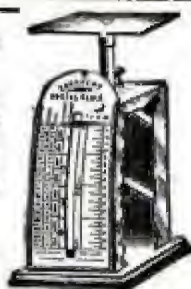
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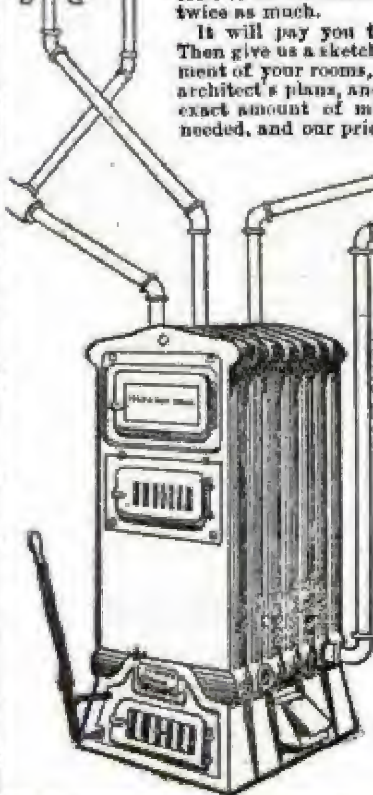
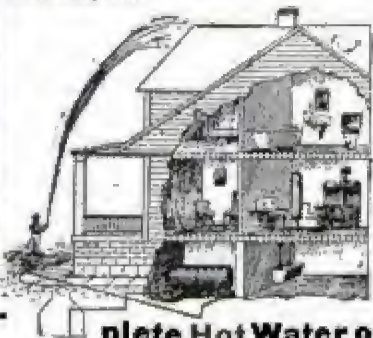
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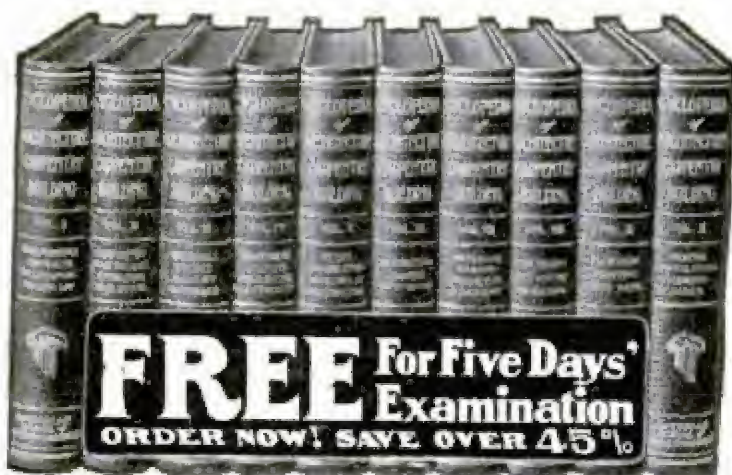
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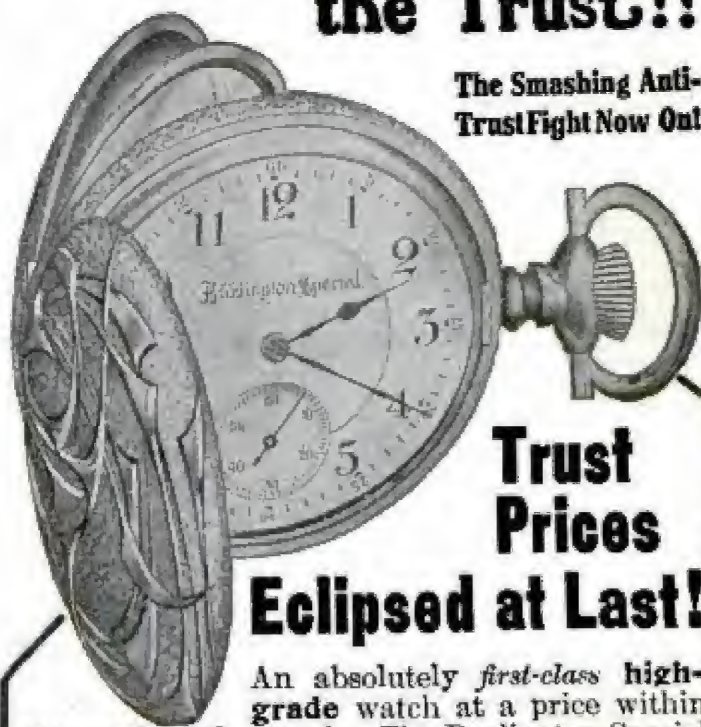
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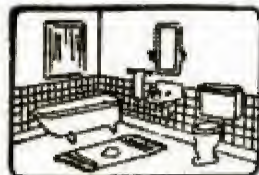
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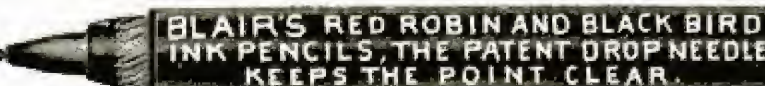
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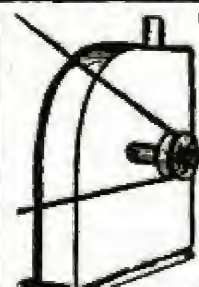
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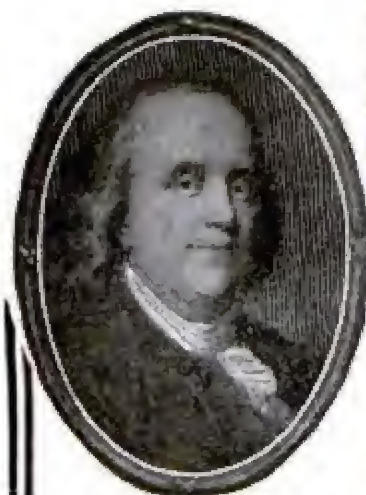
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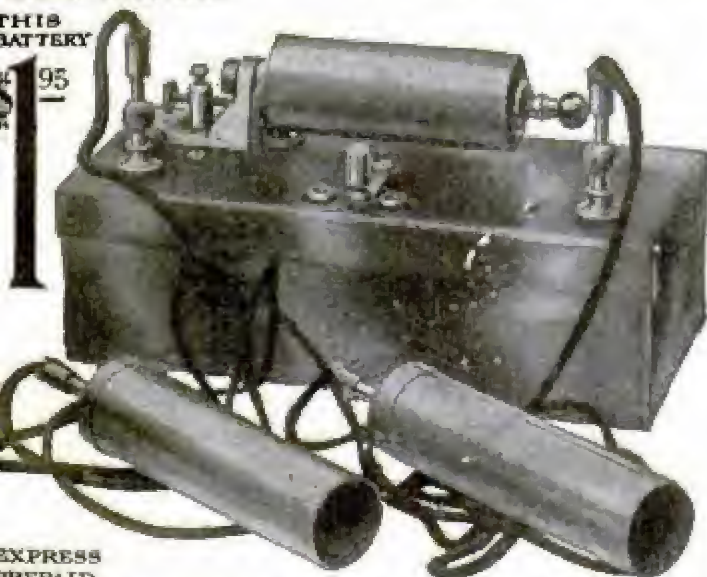
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